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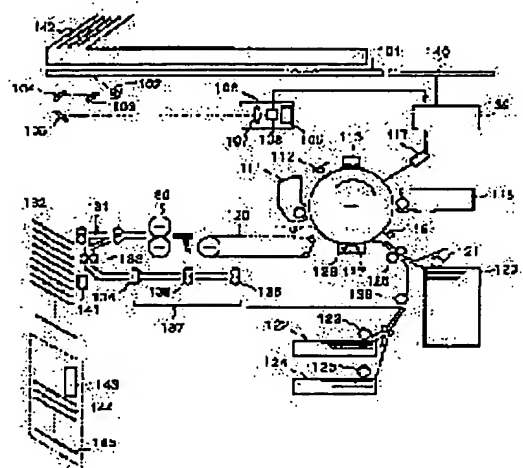
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(54) METHOD AND DEVICE FOR FORMING IMAGE

(57)Abstract:

PROBLEM TO BE SOLVED: To extract images from the original of reduced layout print in the order of pages of original document images and to permit enlarged consecutive photographing by recognizing characters included in plural images in image data and forming them as images for one page.

SOLUTION: It is judged whether an enlarged consecutive photographic copy mode is selected or not. When the copy start key of a control panel 140 is pressed, the original placed on an original glass platen 101 is read by the scanning of a CCD unit 106, and the character recognition area of image data for one original image read by that CCD unit 106 is divided in the set enlarged consecutive photographic copy mode. This processing is executed by the image processing part. Concerning these respective divided areas, a numeral (such as a page number, for example), existent at a prescribed position is recognized by character recognizing processing. In the order from the smallest numeral among these recognized numerals, the image data in the respective divided areas are respectively enlarged and consecutively outputted in the size for one original.



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CLAIMS

[Claim(s)]

[Claim 1] Image formation equipment which is characterized by providing the following and which inputs image data and forms an image a character recognition means to recognize an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained An output means to sort an image formed of means forming which forms said image for two or more sheets as an image for 1 page, and said means forming in order of an alphabetic character corresponding to said image recognized by said character recognition means, and to output it

[Claim 2] It is image formation equipment according to claim 1, and said character recognition means is characterized by recognizing the page number contained in said image.

[Claim 3] It is image formation equipment according to claim 1, and is characterized by for said means forming expanding each of said image for two or more sheets, and forming it as an image for 1 page.

[Claim 4] It is image formation equipment given in claim 1 thru/or any 1 term of 3, and is characterized by having further an image input means to read and input a manuscript image which reduced and printed an image for two or more sheets.

[Claim 5] It has further a directions means to be image formation equipment according to claim 3, and to direct number of sheets of an image contained in image data inputted, said character recognition means is divided into a field of a number according to number of sheets in which said inputted image was directed by said directions means, and it is characterized by to recognize an alphabetic character contained in each of said divided field.

[Claim 6] It is image formation equipment according to claim 5, and said means forming is characterized by expanding image data further according to number of sheets directed by said directions means.

[Claim 7] An image formation method which is characterized by providing the following and which inputs image data and forms an image a character recognition production process which recognizes an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained An output production process which sorts an image formed at a formation production process which forms said image for two or more sheets as an image for 1 page, and said formation production process in order of an alphabetic character corresponding to said image recognized at said character recognition production process, and outputs it

[Claim 8] It is the image formation method according to claim 7, and is characterized by recognizing the page number contained in said image at said character recognition production process.

[Claim 9] It is the image formation method according to claim 7, and is characterized by expanding each of said image for two or more sheets, and forming as an image for 1 page at said formation production process.

[Claim 10] It is the image formation method given in claim 7 thru/or any 1 term of 9, and is characterized by having further an image input production process of reading and inputting a manuscript image which reduced and printed an image for two or more sheets.

[Claim 11] It has further a directions production process which is the image formation method according

to claim 9, and directs number of sheets of image data contained in an image inputted, divides into a field of a number according to number of sheets in which said inputted image was directed at said directions production process at said character recognition production process, and is characterized by recognizing an alphabetic character contained in each of said divided field.

[Claim 12] It is the image formation method according to claim 11, and is characterized by expanding said image data further according to number of sheets directed at said directions production process at said formation production process.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the image formation method and equipment which input manuscript image data and form an image.

[0002]

[Description of the Prior Art] Conventionally, in the copying machine etc., two or more manuscript images are read, they are reduced and the contraction layout arranged and printed on the manuscript of one sheet is known. In this case, an operator can set up now freely that arrangement of an image by which a contraction layout is carried out out of the layout defined beforehand.

[0003]

[Problem(s) to be Solved by the Invention] Thus, the expansion continuous-shooting function which is expanded to the original manuscript image and prints the manuscript of two or more sheets from the manuscript by which contraction layout printing was carried out is known.

[0004] Drawing 10 (A) and (B) are drawings for explaining such expansion continuous-shooting actuation. As shown in drawing 10 (A), in the manuscript 500 with which the manuscript of four sheets was reduced and copied in one sheet of form, the page [4th] manuscript is arranged by the 1st page and the upper right at the upper left of a manuscript 500, and is arranged by the 2nd page and the lower left at the 3rd page and the lower right. When dividing and copying this manuscript 500 to four sheets, as shown in drawing 10 (A), it is outputted with 2 and 3 or 4 pages sequentially from the page [1st] image.

[0005] As shown in drawing 10 (B), at the upper left of a manuscript 501 On the other hand, the 1st page, When dividing and copying the manuscript 501 with which the 4th page is arranged by the 3rd page at the upper right, and is arranged by the lower left at the 2nd page and the lower right to four sheets and it outputs in the same sequence as drawing 10 (A), it is outputted with 3 pages after 1 page, is outputted to the degree with 2 pages and 4 pages, and stops gathering in order of a page.

[0006] Furthermore, as after treatment, when staple processing and bookbinding processing were chosen, that to which the order of a page is not equal will be created, when redoing, or it removed the needle of a staple, the paste at the time of bookbinding was removed, the direction of a document was prepared, and there was a problem of taking time and effort -- after treatment being performed -- again. .

[0007] This invention was made in view of the above-mentioned conventional example, from the manuscript by which contraction layout printing was carried out, in order of the page of the manuscript image of the origin of it, takes out an image and aims at offering the image formation method and equipment which can carry out expansion continuous shooting.

[0008] Moreover, the purpose of this invention has two or more manuscript images with various layouts in offering the image formation method and equipment which can carry out expansion continuous shooting according to the sequence of the manuscript image of these origin from the manuscript by which contraction layout printing was carried out.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, image formation equipment of this invention is equipped with the following configurations. that is, with a character recognition means to be image formation equipment which inputs image data and forms an image, and to recognize an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained It is characterized by having an output means to sort an image formed of means forming which forms said image for two or more sheets as an image for 1 page, and said means forming in order of an alphabetic character corresponding to said image recognized by said character recognition means, and to output it.

[0010] In order to attain the above-mentioned purpose, an image formation method of this invention is equipped with the following production processes. namely, an image formation method which inputs image data and forms an image -- it is -- With a character recognition production process which recognizes an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained It is characterized by having an output production process which sorts an image formed at a formation production process which forms said image for two or more sheets as an image for 1 page, and said formation production process in order of an alphabetic character corresponding to said image recognized at said character recognition production process, and outputs it.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained to details with reference to an accompanying drawing.

[0012] Drawing 1 is a cross section explaining the configuration of the image formation equipment (digital copier) of the gestalt of this operation.

[0013] In drawing, 101 is manuscript base glass and the manuscript with which it was fed from the manuscript automatic feeder (ADF) 142 is laid in a predetermined location one by one. 102 is the manuscript lighting lamp which has a halogen lamp etc., and exposes the manuscript laid in manuscript base glass 101. 103,104,105 is a scan mirror, and it has led the reflected light from a manuscript to the CCD unit 106, holding in the optical scan unit which is not illustrated and reciprocating to the longitudinal direction of drawing 1 . The CCD unit 106 is equipped with the CCD driver 109 grade which drives the image formation lens 107 which carries out image formation of the reflected light from a manuscript to the image sensors 108, such as CCD, and an image sensor 108. The picture signal output from an image sensor 108 is inputted into a controller 139 after being changed into 8-bit digital data.

[0014] 110 is a photoconductor drum and is discharged in preparation for image formation with the pre-exposure lamp 112. 113 is a primary electrification machine and electrifies the surface of a photoconductor drum 110 uniformly. 117 is an exposure means, for example, consists of semiconductor laser etc., exposes a photoconductor drum 110 based on the image data processed by the controller 139 which performs control of an image processing and the whole equipment, and forms the electrostatic latent image according to image data. 118 is a development counter and the black developer (toner) is held. 119 is a front [imprint] electrification machine, and before it imprints in a form the toner image developed on the photoconductor drum 110, it applies high pressure. It is fed with an imprint form by the rotation drive of each feed roller 121,123,125 into equipment, and it stops in the arrangement location of the resist roller 126, and it is a feed unit and is re-fed [beginning timing with the image formed in the photoconductor drum 110 is taken, and] with 120,122,124. 127 is an imprint electrification machine and imprints the toner image developed by the photoconductor drum 110 in the imprint form fed. 128 is separator electrical machinery and separates the imprint form which imprint actuation ended from a photoconductor drum 110. In addition, the toner which remained on the photoconductor drum 110, without imprinting is recovered by the cleaner 111.

[0015] 129 is a conveyance belt, conveys the imprint form which carried out imprint process killing in the location of a fixing assembly 130, for example, is established in an image with heat. 131 is a flapper and controls the conveyance pass of an imprint form which carried out fixing process killing to either of the orientation of the staple sorter 132 or Trey Nakama 137. The form delivered to the staple sorter 132 is classified by each bottle, and the staple section 141 staples with the directions from a controller 139.

133-136 are feed rollers, and it is reversed (multiplex), or noninverting (both sides) is carried out, and they feed Trey Nakama 137 with the imprint form which the fixing process ended once. 138 is a re-feed roller and conveys again the imprint form laid by Trey Nakama 137 to the location of the resist roller 126. The controller 139 is equipped with a microcomputer, the image-processing section, etc. which are mentioned later, and the above-mentioned image formation actuation is performed according to the directions from a control panel 140.

[0016] Drawing 2 is the block diagram showing the configuration of the controller 139 in the image formation equipment of the gestalt of operation of this invention.

[0017] In drawing 2, 201 is CPU which controls the whole image formation equipment of the gestalt of this operation, from the read-only memory 203 (ROM) which memorized the control procedure (control program) of the main part of equipment, reads a control program one by one, and performs it. The address bus and data bus of CPU201 are connected to each load through the bus driver and the address decoder circuit 202. Moreover, 204 is random access memory (RAM) which is the main storage used as storage, working storage, etc. of input data. 205 is an I/O interface port, and an operator keys it and it is connected to each load of the paper detection sensor 210 grade for detecting the control panel 140 which displays the condition of equipment etc. using liquid crystal and LED, and the motors 207 which perform the drive of a feed system, a conveyance system, and optical system, clutches 208, solenoids 209 and the form conveyed.

[0018] The toner residue detection sensor 211 for detecting the amount of toners in a development counter is arranged at the development counter 118, and the output signal is inputted into I/O Port 205. 215 is a high-pressure control unit and is controlling the voltage value (high pressure) to the above-mentioned primary electrification machine 113, a development counter 118, the front [imprint] electrification machine 119, the imprint electrification machine 127, and the separator electrical machinery 128 according to directions of CPU201.

[0019] 206 is the image-processing section, the picture signal outputted from the CCD unit 106 is inputted, and performs the image processing mentioned later, and generates the image data for printing. In this way, the laser unit 117 is driven according to the generated image data. In this way, while the laser beam outputted from the laser unit 117 glares and exposes a photoconductor drum 110 top, in a non-image field, the luminescence condition is detected and the output signal is inputted into I/O Port 205 by the beam detection sensor 213 which is a photo sensor.

[0020] Drawing 3 is the functional block diagram showing the functional configuration of the image-processing section 206 in the controller 139 in the image formation equipment of the gestalt of this operation.

[0021] After, as for the picture signal changed into the electrical signal outputted by CCD108, dispersion between pixels is first amended by the shading circuit 301, in the variable power circuit 302, at the time of a contraction copy, infanticide processing of data is performed and interpolation of data is performed at the time of an expansion copy. Next, in the edge enhancement circuit 303, secondary differential is performed in the window of 5x5, and the edge of an image is emphasized. Since this image data is brightness data, in order to change into the concentration data for finally outputting to semiconductor laser, table search performs data conversion by the gamma conversion circuit 304. In this way, the image data changed into concentration data by the gamma conversion circuit 304 is inputted into the binary-ized processing circuit 305. here -- for example, ED (error diffusion) -- multiple-value data is changed into binary data by law. In this way, the image data changed into binary data is inputted into the synthetic circuit 307, takes alternative or an OR and outputs the inputted image data and the **** data of the memory 310 for images constituted by DRAM. Read/write control to this memory 310 for images is performed by the memory control section 309, and when rotating an image, it is carried out by controlling the read-out address of the image data of an image memory 310. In this way, the image data outputted from the synthetic circuit 307 is inputted into the PWM circuit 308 in order to change into the signal of the luminescence reinforcement of semiconductor laser, and it outputs the signal of the pulse width according to the concentration of an image to the exposure means 117. Moreover, the image data outputted from the variable power circuit 302 is inputted into the direction distinction section 306

of a document, and distinction processing of the direction of a document mentioned later is performed. [0022] Next, with reference to drawing 4 - drawing 9, actuation of the direction distinction section of a document of the gestalt of this operation is explained.

[0023] Drawing 4 is the block diagram showing the configuration of the direction distinction section 306 of a document.

[0024] In drawing 4, the image data outputted from the shading circuit 301 is inputted into CPU / memory section 401, and while image data is saved temporarily here, various control is performed. this CPU / memory section 401 -- CPU201 of a controller 139 -- for example, the bus connection is carried out through the dual port RAM which is not a drawing example, and transmission and reception of data are performed among these. In addition, of course, serial communication is sufficient as this data communication.

[0025] Character recognition / direction distinction section 402 notes that the direction of an alphabetic character expresses the direction of a document to accuracy most. Character recognition is performed [0 degree, 90 degrees, 180 degrees, and 270 degrees] for some kinds of alphabetic character fields in a document from each, the direction where precision is the highest is searched for in the precision (whenever [confidence / of character recognition]: distance over the feature distribution of an alphabetic character) of the character recognition in each [these] direction, and it is made into the direction of a document. As pretreatment for performing character recognition and direction distinction processing by character recognition / direction distinction section 402, from document image data, the field separation section 403 divides the alphabetic character section, graphic form section, natural ****, and table section etc. into a rectangular field, respectively, and performs processing which adds the attributes (alphabetic character section etc.) of each field. The storage section 404 has a hard disk, a magneto-optic disk, etc., and since the processing results (image data, a field separation result, character recognition result, etc.) of various data are saved, it is used. The I/F section 405 is the interface section which operates with interface specifications, such as SCSI and RS232C, and is controlling the data transmission between computers 406. The data memorized by the OK and storage section 404 in information is gained and used for a computer 406 through the I/F section 405.

[0026] Next, the outline of the direction automatic distinction of a document and amendment in the gestalt of this operation, and character recognition processing is explained according to the flow chart of drawing 5.

[0027] The image data (multiple-value image) inputted at step S1 is step S2, and is separated according to attributes, such as the alphabetic character section, graphic form section, natural ****, and table section, by the field separation section 403 to a rectangular field. The field information surrounded with the rectangle is created in fact here.

[0028] Next, it progresses to step S3 and the rectangle information on an alphabetic character field is extracted from each attribute. The amount regions of an alphabetic character are an alphabetic character in the text section, the title section, and a table, the caption section of drawing, etc. here.

[0029] For example, in the case of the document shown in drawing 6 (a) and (c), the rectangle information on an alphabetic character field as shown in drawing 6 (b) and (d), respectively is extracted. And the alphabetic character contained there is recognized at 0 degree of angles of rotation using several blocks in these. next, it progresses to step S5, 90 degrees of the alphabetic character are rotated, and it investigates whether at step S6, four hands of cut, 0 degree, 90 degrees, 180 degrees, and 270 degrees, were alike, respectively, it received, and character recognition was performed, and step S4-S6 are repeated and performed until the character recognition in these four hands of cut is completed.

[0030] In this way, it progresses that the character recognition result in these four directions is obtained to step S7, and the direction of the alphabetic character is determined based on whenever [in each angle of rotation as shown in drawing 8 (c) / confidence]. In this way, it progresses to step S8, the direction of a character string is determined according to the angle of rotation by which character recognition was finally carried out, and the field separation information and character recognition information corresponding to this are acquired further.

[0031] The method of performing field separation processing again to all rotation **** data as one

method in image rotation processing of step S5, and another have the method of applying address translation to a field separation result. Results with the field separation processing which this field separation processing performed to the field separation processing and the rotation image data which were performed in the early phase since the image generally assumed the positive direction differ in many cases. So, it is desirable to take the former method.

[0032] This processing result is transmitted to a computer 406 through the I/F section 405, and is used with the application program of filing of a computer 406 etc. Moreover, it is transmitted to CPU201 of a controller 139 for every image.

[0033] Next, the technique of the direction distinction of a document using character recognition processing is explained.

[0034] The black pixel in [field separation processing] document image data is detected, and the rectangle frame of a black pixel block is created with an outline trace or a labeling method. Next, the black pixel density in the rectangle, the existence of a contiguity rectangle block, the rectangular rate of an aspect ratio, etc. are made into a decision criterion, and alphabetic character fields (a title, the text, caption, etc.), a graphic form field, a natural drawing field, a table field, etc. are distinguished. The rectangle field of the amount region of an alphabetic character is distinguished by this distinction result.

[0035] There are a feature-vector extract and a comparison method as the one method of [character recognition processing] character recognition processing. For example, as shown in drawing 7 (a), suppose that the alphabetic character field containing the alphabetic character "book" was distinguished. As a first stage story, alphabetic character logging processing is performed about this alphabetic character field (refer to drawing 7 (b)). This is the processing which starts the rectangle of one alphabetic character, and if the condition of a black pixel continuity is detectable, it will be called for.

[0036] As a second stage story, a single character is started to the pixel block of $m \times n$ (for example, 64×64) (refer to drawing 7 (c)). And the distribution direction of a black pixel is extracted from the inside using a 3×3 -pixel window (direction vector information: refer to drawing 7 (d)).

[0037] In addition, drawing 7 (d) illustrates a part of direction vector information, shifts a 3×3 above-mentioned pixels window, and acquires dozens of direction vector information. This vector information serves as the feature of an alphabetic character. The contents of the character recognition dictionary beforehand remembered to be this vector information (feature vector) are compared, and the feature extracts an alphabetic character in an order from the nearest alphabetic character to a feature vector. In this case, the feature becomes near sequence with the 1st candidate, the 2nd candidate, and -- at a feature vector. The nearness of the feature to this feature vector becomes the numeric value which shows whenever [nearness / to that alphabetic character / of distance / , i.e., confidence of character recognition,] (precision, likelihood).

[0038] The [direction distinction processing of an alphabetic character] Although it does in this way and whenever [confidence / of character recognition] is called for, it explains using the case of the character string "the name of this invention" which showed the direction distinction processing of an alphabetic character based on whenever [confidence] to drawing 8 .

[0039] Drawing 8 (a) shows the character string of the positive direction, and drawing 8 (b) is a character string turning around 270 degrees of the character string. If an alphabetic character "a book" is observed here, when distinguishing the direction of an alphabetic character, as shown in drawing 8 (c), character recognition is performed about one alphabetic character "a book" from four directions (0 degree, 90 degrees, 180 degrees, and 270 degrees). Each of these angle of rotation does not need to rotate especially a manuscript that what is necessary is just to change how to read the field of an alphabetic character rectangle.

[0040] The character recognition results in each angle of rotation differ mutually, as shown in drawing 8 (c). In addition, whenever [temporary character recognition result / for explanation / and confidence] is not shown in drawing 8 (c), and it does not necessarily become this passage actually.

[0041] In drawing 8 (c), when character recognition is performed from positive (0 degree), it is correctly recognized as a "book" and also whenever [confidence] serves as "0.90" and a high value. When character recognition is performed from the direction rotated 90 degrees, it is incorrect-recognized as a

"town" and also whenever [confidence] falls with "0.40." Thus, incorrect recognition occurs and also whenever [confidence] falls because character recognition was performed based on the feature vector at the time of seeing from the rotated direction. Similarly, by 180 degrees, also when character recognition is performed from the direction rotated 270 degrees, incorrect recognition occurs, and whenever [confidence] falls. In addition, if whenever [according to the direction of character recognition / confidence] is a complicated alphabetic character, the difference will appear notably a certain forge fire.

[0042] In the case of the positive direction, since whenever [confidence] is high No. 1, the result of drawing 8 (c) is judged that a possibility that the document is suitable in the positive direction is high. In order to raise the distinction precision of such a direction of an alphabetic character, character recognition is similarly performed from four directions about two or more alphabetic characters within the same block. Furthermore, since there is a possibility of distinguishing the direction of an alphabetic character accidentally about a special character string when the direction of an alphabetic character is distinguished only with one block, character recognition same about two or more blocks is performed. And about each block, the average value of whenever [according to the 4 directions of each alphabetic character for recognition within the block concerned / confidence] is calculated, further, the average value over the average value of whenever [according to the 4 directions in each block / confidence] is calculated, and this average value authorizes the highest direction as a direction of an alphabetic character (the direction of a document).

[0043] Thus, two or more characters become possible [distinguishing the direction of an alphabetic character (document) to high degree of accuracy] by [within the same block] authorizing the direction of an alphabetic character by whenever [confidence / of two or more characters in the same block] further, without authorizing the direction of an alphabetic character by whenever [confidence / of only one character]. However, even if it distinguishes the direction of an alphabetic character by whenever [confidence / of only one character] or distinguishes the direction of an alphabetic character by whenever [confidence / of two or more characters in the same block], the direction of an alphabetic character can be conventionally distinguished to high degree of accuracy.

[0044] Next, when the distinction result of the direction of an alphabetic character (the direction of a document) is the direction of [other than the positive direction], a subject-copy image is rotated so that the direction of an alphabetic character may become in the positive direction. It is possible to perform this rotation simply with well-known technology using CPU / memory 401 of drawing 4, and that explanation is omitted.

[0045] The character recognition information shown in the subject-copy image data shown in drawing 9 (A), the field separation data shown in drawing 9 (B), and drawing 9 (C) by the above processings can be acquired. Such information is sent to CPU201 of a controller 139 as mentioned above, and is used for various image processings and various control.

[0046] "header" which shows the purport which is field separation data as the data format of field separation data was shown in drawing 9 (B) here, The information on each field (block) which was constituted by identifier [of the separated field] "rect1" - "rect4", and was distinguished by these identifiers The number "order" of a block, the attribute of a block (alphabetic character section, graphic form section, etc.) "att", The coordinate value at the upper left of a block "x1" and "y1", the width of face of a block "w", "direction" which shows the height "h" of a block, columnar writing, or lateral writing, It is constituted by the attribute "upperAtt" of "selfID" which is ID of the block concerned, "upperID" which is ID of the parent block which includes the block concerned, and a parent block, and the reserve field "reserve."

[0047] Moreover, character recognition information is constituted by the combination information on "blk header" equivalent to the above "rect1" which shows the block with which it has "header" which shows the purport which is character recognition information, for example, the character recognition information "OCR1" about single alphabetic characters, such as a "book", etc. and the alphabetic character concerned are contained as shown in drawing 9 (C).

[0048] And each character recognition information, such as "OCR1", is constituted by "type" which

shows whether it is an alphabetic character or it is blank, the 1st according to whenever [confidence / of the above-mentioned character recognition] - 5th candidate alphabetic character "alphabetic character 1" - "an alphabetic character 5", the logging location "x1" of the alphabetic character concerned and "y1", the width of character "w" concerned, the height of character "h" concerned, and the reserve field "reserve."

[0049] Next, with reference to the flow chart and drawing 12 of drawing 11, the details of the expansion continuous-shooting copy actuation in the image formation equipment of the gestalt of this operation are explained.

[0050] It judges whether expansion continuous-shooting copy mode was first chosen at step S11. Copy processing actuation directed by progressing to step S16 when it is not expansion continuous-shooting copy mode is performed, and it ends.

[0051] If expansion continuous-shooting copy mode is chosen at step S11, it will become step S12 with the input waiting of the copy start key of the progress control panel 140. If the copy start key of a control panel 140 is pushed, it will progress to step S13, and the manuscript laid on the manuscript glass base 101 is read by the scan of the CCD unit 106, and the set-up expansion continuous-shooting copy mode divides the character recognition area of the image data for one manuscript image read in the CCD unit 106. This processing is performed in the image-processing section 206. Here, if it is for example, the 1to4 mode (the original manuscript of four sheets is printed from the manuscript of one sheet printed with the contraction layout), if it is the 1to6 mode, it will divide into four area in six area. Next, it recognizes to each area they-divided by progressing to step S14 by character recognition processing which mentioned above the numeric character (for example, page number) which exists in a position. And it progresses to step S15, and the image data of each area divided into the small order of the recognized numeric character at step S13 is expanded to the size of one manuscript, respectively, and a copy output is carried out. In this case, if it is 1to4 like drawing 10, that dilation ratio will be set to 2x2. In addition, about an expansion continuous-shooting copy, since it is already common knowledge, detailed explanation is omitted.

[0052] As [explained / as the above actuation showed to drawing 12 / drawing 10] Also when it is the manuscript 500 with which the 4th page is arranged by the upper left at the 1st page and the upper right, and is arranged by the 2nd page and the lower left at the 3rd page and the lower right. Moreover, even when it is the manuscript 501 with which the 4th page is arranged by the upper left at the 1st page and its bottom, and is arranged by the 2nd page and the lower right at the 3rd page and the lower right, an expansion continuous-shooting copy output can be carried out from 1 page at sequence.

[0053] In addition, although the sequence of a manuscript is determined with the gestalt of this operation based on the page number indicated by the central lower part of each original manuscript image, this invention is not what is limited to this. For example, the numeric character (it is not necessarily the page number) which was described in the page number given to the right, the upper left edge, or the lower limit or the predetermined location of each manuscript and which shows the order which wants to put these manuscripts in order may be based, and the order of an output of the copy which carried out expansion continuous shooting may be determined.

[0054] In addition, even if it applies this invention to the system which consists of two or more devices (for example, a host computer, an interface device, a reader, a printer, etc.), it may be applied to the equipments (for example, a copying machine, facsimile apparatus, etc.) which consist of one device.

[0055] Moreover, the purpose of this invention supplies the storage which recorded the program code of the software which realizes the function of the operation gestalt mentioned above to a system or equipment, and is attained also by carrying out read-out activation of the program code with which the computer (or CPU and MPU) of the system or equipment was stored in the storage.

[0056] In this case, the function of the operation gestalt which the program code itself read from the storage mentioned above will be realized, and the storage which memorized that program code will constitute this invention.

[0057] As a storage for supplying a program code, a floppy disk, a hard disk, an optical disk, a magneto-optic disk, CD-ROM, CD-R, a magnetic tape, the memory card of a non-volatile, ROM, etc. can be

used, for example.

[0058] Moreover, by performing the program code which the computer read, a part or all of processing that OS (operating system) which the function of the operation gestalt mentioned above is not only realized, but is working on a computer based on directions of the program code is actual is performed, and also when the function of the operation gestalt mentioned above by the processing is realized, it is contained.

[0059] Furthermore, after the program code read from the storage is written in the memory with which the functional expansion unit connected to the functional add-in board inserted in the computer or the computer is equipped, a part or all of processing that CPU with which the functional add-in board and functional expansion unit are equipped is actual performs, and also when the function of the operation gestalt mentioned above by the processing is realized, it is contained based on directions of the program code.

[0060] As explained above, according to the gestalt of this operation, it can output in order of the page of a request of the manuscript image of these origin by recognizing alphabetic information, such as the page number of each manuscript image in the manuscript containing two or more manuscript images by which contraction layout printing was carried out, in the case of an expansion continuous-shooting copy.

[0061]

[Effect of the Invention] As explained above, according to this invention, in order of the page of the manuscript image of the origin of it, an image is taken out and it is effective in the ability to carry out expansion continuous shooting from the manuscript by which contraction layout printing was carried out.

[0062] Moreover, according to this invention, it is effective in the ability to carry out expansion continuous shooting according to the sequence of the manuscript image of these origin from the manuscript with which contraction layout printing of two or more manuscript images with various layouts was carried out.

[Translation done.]

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TECHNICAL FIELD

[The technical field to which invention belongs] This invention relates to the image formation method and equipment which input manuscript image data and form an image.

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PRIOR ART

[Description of the Prior Art] Conventionally, in the copying machine etc., two or more manuscript images are read, they are reduced and the contraction layout arranged and printed on the manuscript of one sheet is known. In this case, an operator can set up now freely that arrangement of an image by which a contraction layout is carried out out of the layout defined beforehand.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to this invention, in order of the page of the manuscript image of the origin of it, an image is taken out and it is effective in the ability to carry out expansion continuous shooting from the manuscript by which contraction layout printing was carried out.

[0062] Moreover, according to this invention, it is effective in the ability to carry out expansion continuous shooting according to the sequence of the manuscript image of these origin from the manuscript with which contraction layout printing of two or more manuscript images with various layouts was carried out.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Thus, the expansion continuous-shooting function which is expanded to the original manuscript image and prints the manuscript of two or more sheets from the manuscript by which contraction layout printing was carried out is known.

[0004] Drawing 10 (A) and (B) are drawings for explaining such expansion continuous-shooting actuation. As shown in drawing 10 (A), in the manuscript 500 with which the manuscript of four sheets was reduced and copied in one sheet of form, the page [4th] manuscript is arranged by the 1st page and the upper right at the upper left of a manuscript 500, and is arranged by the 2nd page and the lower left at the 3rd page and the lower right. When dividing and copying this manuscript 500 to four sheets, as shown in drawing 10 (A), it is outputted with 2 and 3 or 4 pages sequentially from the page [1st] image.

[0005] As shown in drawing 10 (B), at the upper left of a manuscript 501. On the other hand, the 1st page, When dividing and copying the manuscript 501 with which the 4th page is arranged by the 3rd page at the upper right, and is arranged by the lower left at the 2nd page and the lower right to four sheets and it outputs in the same sequence as drawing 10 (A), it is outputted with 3 pages after 1 page, is outputted to the degree with 2 pages and 4 pages, and stops gathering in order of a page.

[0006] Furthermore, as after treatment, when staple processing and bookbinding processing were chosen, that to which the order of a page is not equal will be created, when redoing, or it removed the needle of a staple, the paste at the time of bookbinding was removed, the direction of a document was prepared, and there was a problem of taking time and effort -- after treatment being performed -- again. .

[0007] This invention was made in view of the above-mentioned conventional example, from the manuscript by which contraction layout printing was carried out, in order of the page of the manuscript image of the origin of it, takes out an image and aims at offering the image formation method and equipment which can carry out expansion continuous shooting.

[0008] Moreover, the purpose of this invention has two or more manuscript images with various layouts in offering the image formation method and equipment which can carry out expansion continuous shooting according to the sequence of the manuscript image of these origin from the manuscript by which contraction layout printing was carried out.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, image formation equipment of this invention is equipped with the following configurations. that is, with a character recognition means to be image formation equipment which inputs image data and forms an image, and to recognize an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained It is characterized by having an output means to sort an image formed of means forming which forms said image for two or more sheets as an image for 1 page, and said means forming in order of an alphabetic character corresponding to said image recognized by said character recognition means, and to output it.

[0010] In order to attain the above-mentioned purpose, an image formation method of this invention is equipped with the following production processes. namely, an image formation method which inputs image data and forms an image -- it is -- With a character recognition production process which recognizes an alphabetic character of an image for two or more sheets contained in said image data which is alike, respectively and is contained It is characterized by having an output production process which sorts an image formed at a formation production process which forms said image for two or more sheets as an image for 1 page, and said formation production process in order of an alphabetic character corresponding to said image recognized at said character recognition production process, and outputs it.

[0011]

[Embodiment of the Invention] Hereafter, the gestalt of suitable operation of this invention is explained to details with reference to an accompanying drawing.

[0012] Drawing 1 is a cross section explaining the configuration of the image formation equipment (digital copier) of the gestalt of this operation.

[0013] In drawing, 101 is manuscript base glass and the manuscript with which it was fed from the manuscript automatic feeder (ADF) 142 is laid in a predetermined location one by one. 102 is the manuscript lighting lamp which has a halogen lamp etc., and exposes the manuscript laid in manuscript base glass 101. 103, 104, 105 is a scan mirror, and it has led the reflected light from a manuscript to the CCD unit 106, holding in the optical scan unit which is not illustrated and reciprocating to the longitudinal direction of drawing 1. The CCD unit 106 is equipped with the CCD driver 109 grade which drives the image formation lens 107 which carries out image formation of the reflected light from a manuscript to the image sensors 108, such as CCD, and an image sensor 108. The picture signal output from an image sensor 108 is inputted into a controller 139 after being changed into 8-bit digital data.

[0014] 110 is a photoconductor drum and is discharged in preparation for image formation with the pre-exposure lamp 112. 113 is a primary electrification machine and electrifies the surface of a photoconductor drum 110 uniformly. 117 is an exposure means, for example, consists of semiconductor laser etc., exposes a photoconductor drum 110 based on the image data processed by the controller 139 which performs control of an image processing and the whole equipment, and forms the electrostatic latent image according to image data. 118 is a development counter and the black developer (toner) is held. 119 is a front [imprint] electrification machine, and before it imprints in a form the toner image developed on the photoconductor drum 110, it applies high pressure. It is fed with an imprint form by

the rotation drive of each feed roller 121,123,125 into equipment, and it stops in the arrangement location of the resist roller 126, and it is a feed unit and is re-fed [beginning timing with the image formed in the photoconductor drum 110 is taken, and] with 120,122,124. 127 is an imprint electrification machine and imprints the toner image developed by the photoconductor drum 110 in the imprint form fed. 128 is separator electrical machinery and separates the imprint form which imprint actuation ended from a photoconductor drum 110. In addition, the toner which remained on the photoconductor drum 110, without imprinting is recovered by the cleaner 111.

[0015] 129 is a conveyance belt, conveys the imprint form which carried out imprint process killing in the location of a fixing assembly 130, for example, is established in an image with heat. 131 is a flapper and controls the conveyance pass of an imprint form which carried out fixing process killing to either of the orientation of the staple sorter 132 or Trey Nakama 137. The form delivered to the staple sorter 132 is classified by each bottle, and the staple section 141 staples with the directions from a controller 139. 133-136 are feed rollers, and it is reversed (multiplex), or noninverting (both sides) is carried out, and they feed Trey Nakama 137 with the imprint form which the fixing process ended once. 138 is a re-feed roller and conveys again the imprint form laid by Trey Nakama 137 to the location of the resist roller 126. The controller 139 is equipped with a microcomputer, the image-processing section, etc. which are mentioned later, and the above-mentioned image formation actuation is performed according to the directions from a control panel 140.

[0016] Drawing 2 is the block diagram showing the configuration of the controller 139 in the image formation equipment of the gestalt of operation of this invention.

[0017] In drawing 2, 201 is CPU which controls the whole image formation equipment of the gestalt of this operation, from the read-only memory 203 (ROM) which memorized the control procedure (control program) of the main part of equipment, reads a control program one by one, and performs it. The address bus and data bus of CPU201 are connected to each load through the bus driver and the address decoder circuit 202. Moreover, 204 is random access memory (RAM) which is the main storage used as storage, working storage, etc. of input data. 205 is an I/O interface port, and an operator keys it and it is connected to each load of the paper detection sensor 210 grade for detecting the control panel 140 which displays the condition of equipment etc. using liquid crystal and LED, and the motors 207 which perform the drive of a feed system, a conveyance system, and optical system, clutches 208, solenoids 209 and the form conveyed.

[0018] The toner residue detection sensor 211 for detecting the amount of toners in a development counter is arranged at the development counter 118, and the output signal is inputted into I/O Port 205. 215 is a high-pressure control unit and is controlling the voltage value (high pressure) to the above-mentioned primary electrification machine 113, a development counter 118, the front [imprint] electrification machine 119, the imprint electrification machine 127, and the separator electrical machinery 128 according to directions of CPU201.

[0019] 206 is the image-processing section, the picture signal outputted from the CCD unit 106 is inputted, and performs the image processing mentioned later, and generates the image data for printing. In this way, the laser unit 117 is driven according to the generated image data. In this way, while the laser beam outputted from the laser unit 117 glares and exposes a photoconductor drum 110 top, in a non-image field, the luminescence condition is detected and the output signal is inputted into I/O Port 205 by the beam detection sensor 213 which is a photo sensor.

[0020] Drawing 3 is the functional block diagram showing the functional configuration of the image-processing section 206 in the controller 139 in the image formation equipment of the gestalt of this operation.

[0021] After, as for the picture signal changed into the electrical signal outputted by CCD108, dispersion between pixels is first amended by the shading circuit 301, in the variable power circuit 302, at the time of a contraction copy, infanticide processing of data is performed and interpolation of data is performed at the time of an expansion copy. Next, in the edge enhancement circuit 303, secondary differential is performed in the window of 5x5, and the edge of an image is emphasized. Since this image data is brightness data, in order to change into the concentration data for finally outputting to

semiconductor laser, table search performs data conversion by the gamma conversion circuit 304. In this way, the image data changed into concentration data by the gamma conversion circuit 304 is inputted into the binary-ized processing circuit 305. here -- for example, ED (error diffusion) -- multiple-value data is changed into binary data by law. In this way, the image data changed into binary data is inputted into the synthetic circuit 307, takes alternative or an OR and outputs the inputted image data and the **** data of the memory 310 for images constituted by DRAM. Read/write control to this memory 310 for images is performed by the memory control section 309, and when rotating an image, it is carried out by controlling the read-out address of the image data of an image memory 310. In this way, the image data outputted from the synthetic circuit 307 is inputted into the PWM circuit 308 in order to change into the signal of the luminescence reinforcement of semiconductor laser, and it outputs the signal of the pulse width according to the concentration of an image to the exposure means 117. Moreover, the image data outputted from the variable power circuit 302 is inputted into the direction distinction section 306 of a document, and distinction processing of the direction of a document mentioned later is performed.

[0022] Next, with reference to drawing 4 - drawing 9, actuation of the direction distinction section of a document of the gestalt of this operation is explained.

[0023] Drawing 4 is the block diagram showing the configuration of the direction distinction section 306 of a document.

[0024] In drawing 4, the image data outputted from the shading circuit 301 is inputted into CPU / memory section 401, and while image data is saved temporarily here, various control is performed. this CPU / memory section 401 -- CPU201 of a controller 139 -- for example, the bus connection is carried out through the dual port RAM which is not a drawing example, and transmission and reception of data are performed among these. In addition, of course, serial communication is sufficient as this data communication.

[0025] Character recognition / direction distinction section 402 notes that the direction of an alphabetic character expresses the direction of a document to accuracy most. Character recognition is performed [0 degree, 90 degrees, 180 degrees, and 270 degrees] for some kinds of alphabetic character fields in a document from each, the direction where precision is the highest is searched for in the precision (whenever [confidence / of character recognition]: distance over the feature distribution of an alphabetic character) of the character recognition in each [these] direction, and it is made into the direction of a document. As pretreatment for performing character recognition and direction distinction processing by character recognition / direction distinction section 402, from document image data, the field separation section 403 divides the alphabetic character section, graphic form section, natural ****, and table section etc. into a rectangular field, respectively, and performs processing which adds the attributes (alphabetic character section etc.) of each field. The storage section 404 has a hard disk, a magneto-optic disk, etc., and since the processing results (image data, a field separation result, character recognition result, etc.) of various data are saved, it is used. The I/F section 405 is the interface section which operates with interface specifications, such as SCSI and RS232C, and is controlling the data transmission between computers 406. The data memorized by the OK and storage section 404 in information is gained and used for a computer 406 through the I/F section 405.

[0026] Next, the outline of the direction automatic distinction of a document and amendment in the gestalt of this operation, and character recognition processing is explained according to the flow chart of drawing 5.

[0027] The image data (multiple-value image) inputted at step S1 is step S2, and is separated according to attributes, such as the alphabetic character section, graphic form section, natural ****, and table section, by the field separation section 403 to a rectangular field. The field information surrounded with the rectangle is created in fact here.

[0028] Next, it progresses to step S3 and the rectangle information on an alphabetic character field is extracted from each attribute. The amount regions of an alphabetic character are an alphabetic character in the text section, the title section, and a table, the caption section of drawing, etc. here.

[0029] For example, in the case of the document shown in drawing 6 (a) and (c), the rectangle information on an alphabetic character field as shown in drawing 6 (b) and (d), respectively is extracted.

And the alphabetic character contained there is recognized at 0 degree of angles of rotation using several blocks in these. next, it progresses to step S5, 90 degrees of the alphabetic character are rotated, and it investigates whether at step S6, four hands of cut, 0 degree, 90 degrees, 180 degrees, and 270 degrees, were alike, respectively, it received, and character recognition was performed, and step S4-S6 are repeated and performed until the character recognition in these four hands of cut is completed.

[0030] In this way, it progresses that the character recognition result in these four directions is obtained to step S7, and the direction of the alphabetic character is determined based on whenever [in each angle of rotation as shown in drawing 8 (c) / confidence]. In this way, it progresses to step S8, the direction of a character string is determined according to the angle of rotation by which character recognition was finally carried out, and the field separation information and character recognition information corresponding to this are acquired further.

[0031] The method of performing field separation processing again to all rotation **** data as one method in image rotation processing of step S5, and another have the method of applying address translation to a field separation result. Results with the field separation processing which this field separation processing performed to the field separation processing and the rotation image data which were performed in the early phase since the image generally assumed the positive direction differ in many cases. So, it is desirable to take the former method.

[0032] This processing result is transmitted to a computer 406 through the I/F section 405, and is used with the application program of filing of a computer 406 etc. Moreover, it is transmitted to CPU201 of a controller 139 for every image.

[0033] Next, the technique of the direction distinction of a document using character recognition processing is explained.

[0034] The black pixel in [field separation processing] document image data is detected, and the rectangle frame of a black pixel block is created with an outline trace or a labeling method. Next, the black pixel density in the rectangle, the existence of a contiguity rectangle block, the rectangular rate of an aspect ratio, etc. are made into a decision criterion, and alphabetic character fields (a title, the text, caption, etc.), a graphic form field, a natural drawing field, a table field, etc. are distinguished. The rectangle field of the amount region of an alphabetic character is distinguished by this distinction result.

[0035] There are a feature-vector extract and a comparison method as the one method of [character recognition processing] character recognition processing. For example, as shown in drawing 7 (a), suppose that the alphabetic character field containing the alphabetic character "book" was distinguished. As a first stage story, alphabetic character logging processing is performed about this alphabetic character field (refer to drawing 7 (b)). This is the processing which starts the rectangle of one alphabetic character, and if the condition of a black pixel continuity is detectable, it will be called for.

[0036] As a second stage story, a single character is started to the pixel block of mxn (for example, 64x64) (refer to drawing 7 (c)). And the distribution direction of a black pixel is extracted from the inside using a 3x3-pixel window (direction vector information: refer to drawing 7 (d)).

[0037] In addition, drawing 7 (d) illustrates a part of direction vector information, shifts a 3x3 above-mentioned pixels window, and acquires dozens of direction vector information. This vector information serves as the feature of an alphabetic character. The contents of the character recognition dictionary beforehand remembered to be this vector information (feature vector) are compared, and the feature extracts an alphabetic character in an order from the nearest alphabetic character to a feature vector. In this case, the feature becomes near sequence with the 1st candidate, the 2nd candidate, and -- at a feature vector. The nearness of the feature to this feature vector becomes the numeric value which shows whenever [nearness / to that alphabetic character / of distance / , i.e., confidence of character recognition,] (precision, likelihood).

[0038] The [direction distinction processing of an alphabetic character] Although it does in this way and whenever [confidence / of character recognition] is called for, it explains using the case of the character string "the name of this invention" which showed the direction distinction processing of an alphabetic character based on whenever [confidence] to drawing 8 .

[0039] Drawing 8 (a) shows the character string of the positive direction, and drawing 8 (b) is a

character string turning around 270 degrees of the character string. If an alphabetic character "a book" is observed here, when distinguishing the direction of an alphabetic character, as shown in drawing 8 (c), character recognition is performed about one alphabetic character "a book" from four directions (0 degree, 90 degrees, 180 degrees, and 270 degrees). Each of these angle of rotation does not need to rotate especially a manuscript that what is necessary is just to change how to read the field of an alphabetic character rectangle.

[0040] The character recognition results in each angle of rotation differ mutually, as shown in drawing 8 (c). In addition, whenever [temporary character recognition result / for explanation / and confidence] is not shown in drawing 8 (c), and it does not necessarily become this passage actually.

[0041] In drawing 8 (c), when character recognition is performed from positive (0 degree), it is correctly recognized as a "book" and also whenever [confidence] serves as "0.90" and a high value. When character recognition is performed from the direction rotated 90 degrees, it is incorrect-recognized as a "town" and also whenever [confidence] falls with "0.40." Thus, incorrect recognition occurs and also whenever [confidence] falls because character recognition was performed based on the feature vector at the time of seeing from the rotated direction. Similarly, by 180 degrees, also when character recognition is performed from the direction rotated 270 degrees, incorrect recognition occurs, and whenever [confidence] falls. In addition, if whenever [according to the direction of character recognition / confidence] is a complicated alphabetic character, the difference will appear notably a certain forge fire.

[0042] In the case of the positive direction, since whenever [confidence] is high No. 1, the result of drawing 8 (c) is judged that a possibility that the document is suitable in the positive direction is high. In order to raise the distinction precision of such a direction of an alphabetic character, character recognition is similarly performed from four directions about two or more alphabetic characters within the same block. Furthermore, since there is a possibility of distinguishing the direction of an alphabetic character accidentally about a special character string when the direction of an alphabetic character is distinguished only with one block, character recognition same about two or more blocks is performed. And about each block, the average value of whenever [according to the 4 directions of each alphabetic character for recognition within the block concerned / confidence] is calculated, further, the average value over the average value of whenever [according to the 4 directions in each block / confidence] is calculated, and this average value authorizes the highest direction as a direction of an alphabetic character (the direction of a document).

[0043] Thus, two or more characters become possible [distinguishing the direction of an alphabetic character (document) to high degree of accuracy] by [within the same block] authorizing the direction of an alphabetic character by whenever [confidence / of two or more characters in the same block] further, without authorizing the direction of an alphabetic character by whenever [confidence / of only one character]. However, even if it distinguishes the direction of an alphabetic character by whenever [confidence / of only one character] or distinguishes the direction of an alphabetic character by whenever [confidence / of two or more characters in the same block], the direction of an alphabetic character can be conventionally distinguished to high degree of accuracy.

[0044] Next, when the distinction result of the direction of an alphabetic character (the direction of a document) is the direction of [other than the positive direction], a subject-copy image is rotated so that the direction of an alphabetic character may become in the positive direction. It is possible to perform this rotation simply with well-known technology using CPU / memory 401 of drawing 4 , and that explanation is omitted.

[0045] The character recognition information shown in the subject-copy image data shown in drawing 9 (A), the field separation data shown in drawing 9 (B), and drawing 9 (C) by the above processings can be acquired. Such information is sent to CPU201 of a controller 139 as mentioned above, and is used for various image processings and various control.

[0046] "header" which shows the purport which is field separation data as the data format of field separation data was shown in drawing 9 (B) here, The information on each field (block) which was constituted by identifier [of the separated field] "rect1" - "rect4", and was distinguished by these

identifiers The number "order" of a block, the attribute of a block (alphabetic character section, graphic form section, etc.) "att", The coordinate value at the upper left of a block "x1" and "y1", the width of face of a block "w", "direction" which shows the height "h" of a block, columnar writing, or lateral writing, It is constituted by the attribute "upperAtt" of "selfID" which is ID of the block concerned, "upperID" which is ID of the parent block which includes the block concerned, and a parent block, and the reserve field "reserve."

[0047] Moreover, character recognition information is constituted by the combination information on "blk header" equivalent to the above "rect1" which shows the block with which it has "header" which shows the purport which is character recognition information, for example, the character recognition information "OCR1" about single alphabetic characters, such as a "book", etc. and the alphabetic character concerned are contained as shown in drawing 9 (C).

[0048] And each character recognition information, such as "OCR1", is constituted by "type" which shows whether it is an alphabetic character or it is blank, the 1st according to whenever [confidence / of the above-mentioned character recognition] - 5th candidate alphabetic character "alphabetic character 1" - "an alphabetic character 5", the logging location "x1" of the alphabetic character concerned and "y1", the width of character "w" concerned, the height of character "h" concerned, and the reserve field "reserve."

[0049] Next, with reference to the flow chart and drawing 12 of drawing 11, the details of the expansion continuous-shooting copy actuation in the image formation equipment of the gestalt of this operation are explained.

[0050] It judges whether expansion continuous-shooting copy mode was first chosen at step S11. Copy processing actuation directed by progressing to step S16 when it is not expansion continuous-shooting copy mode is performed, and it ends.

[0051] If expansion continuous-shooting copy mode is chosen at step S11, it will become step S12 with the input waiting of the copy start key of the progress control panel 140. If the copy start key of a control panel 140 is pushed, it will progress to step S13, and the manuscript laid on the manuscript glass base 101 is read by the scan of the CCD unit 106, and the set-up expansion continuous-shooting copy mode divides the character recognition area of the image data for one manuscript image read in the CCD unit 106. This processing is performed in the image-processing section 206. Here, if it is for example, the 1to4 mode (the original manuscript of four sheets is printed from the manuscript of one sheet printed with the contraction layout), if it is the 1to6 mode, it will divide into four area in six area. Next, it recognizes to each area they-divided by progressing to step S14 by character recognition processing which mentioned above the numeric character (for example, page number) which exists in a position. And it progresses to step S15, and the image data of each area divided into the small order of the recognized numeric character at step S13 is expanded to the size of one manuscript, respectively, and a copy output is carried out. In this case, if it is 1to4 like drawing 10, that dilation ratio will be set to 2x2. In addition, about an expansion continuous-shooting copy, since it is already common knowledge, detailed explanation is omitted.

[0052] As [explained / as the above actuation showed to drawing 12 / drawing 10] Also when it is the manuscript 500 with which the 4th page is arranged by the upper left at the 1st page and the upper right, and is arranged by the 2nd page and the lower left at the 3rd page and the lower right Moreover, even when it is the manuscript 501 with which the 4th page is arranged by the upper left at the 1st page and its bottom, and is arranged by the 2nd page and the lower right at the 3rd page and the lower right, an expansion continuous-shooting copy output can be carried out from 1 page at sequence.

[0053] In addition, although the sequence of a manuscript is determined with the gestalt of this operation based on the page number indicated by the central lower part of each original manuscript image, this invention is not what is limited to this. For example, the numeric character (it is not necessarily the page number) which was described in the page number given to the right, the upper left edge, or the lower limit or the predetermined location of each manuscript and which shows the order which wants to put these manuscripts in order may be based, and the order of an output of the copy which carried out expansion continuous shooting may be determined.

[0054] In addition, even if it applies this invention to the system which consists of two or more devices (for example, a host computer, an interface device, a reader, a printer, etc.), it may be applied to the equipments (for example, a copying machine, facsimile apparatus, etc.) which consist of one device.

[0055] Moreover, the purpose of this invention supplies the storage which recorded the program code of the software which realizes the function of the operation gestalt mentioned above to a system or equipment, and is attained also by carrying out read-out activation of the program code with which the computer (or CPU and MPU) of the system or equipment was stored in the storage.

[0056] In this case, the function of the operation gestalt which the program code itself read from the storage mentioned above will be realized, and the storage which memorized that program code will constitute this invention.

[0057] As a storage for supplying a program code, a floppy disk, a hard disk, an optical disk, a magneto-optic disk, CD-ROM, CD-R, a magnetic tape, the memory card of a non-volatile, ROM, etc. can be used, for example.

[0058] Moreover, by performing the program code which the computer read, a part or all of processing that OS (operating system) which the function of the operation gestalt mentioned above is not only realized, but is working on a computer based on directions of the program code is actual is performed, and also when the function of the operation gestalt mentioned above by the processing is realized, it is contained.

[0059] Furthermore, after the program code read from the storage is written in the memory with which the functional expansion unit connected to the functional add-in board inserted in the computer or the computer is equipped, a part or all of processing that CPU with which the functional add-in board and functional expansion unit are equipped is actual performs, and also when the function of the operation gestalt mentioned above by the processing is realized, it is contained based on directions of the program code.

[0060] As explained above, according to the gestalt of this operation, it can output in order of the page of a request of the manuscript image of these origin by recognizing alphabetic information, such as the page number of each manuscript image in the manuscript containing two or more manuscript images by which contraction layout printing was carried out, in the case of an expansion continuous-shooting copy.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a cross section explaining the configuration of the image formation equipment of the gestalt of operation of this invention.

[Drawing 2] It is the block diagram showing the configuration of the controller of the image formation equipment of the gestalt of this operation.

[Drawing 3] It is the functional block diagram showing the functional configuration of the image-processing section of the controller of the gestalt of this operation.

[Drawing 4] It is the block diagram showing the configuration of the direction distinction section of a document of the gestalt of this operation.

[Drawing 5] It is the flow chart which shows the direction automatic distinction of a document and character recognition processing in a gestalt of this operation.

[Drawing 6] It is drawing explaining the field separation by distinction processing of the direction of a document in the gestalt of this operation.

[Drawing 7] It is drawing for explaining the processing process of the character recognition processing in the gestalt of this operation.

[Drawing 8] It is drawing for explaining automatic distinction processing of the direction of a document (alphabetic character) of the gestalt of this operation.

[Drawing 9] It is drawing having shown the data format of the field separation in the gestalt of this operation, and character recognition information.

[Drawing 10] It is drawing for explaining the conventional example.

[Drawing 11] It is the flow chart which showed processing with the expansion continuous shooting mode in the image formation equipment of the gestalt of operation of this invention.

[Drawing 12] It is drawing explaining the expansion continuous-shooting copy in the gestalt of operation of this invention.

[Translation done.]

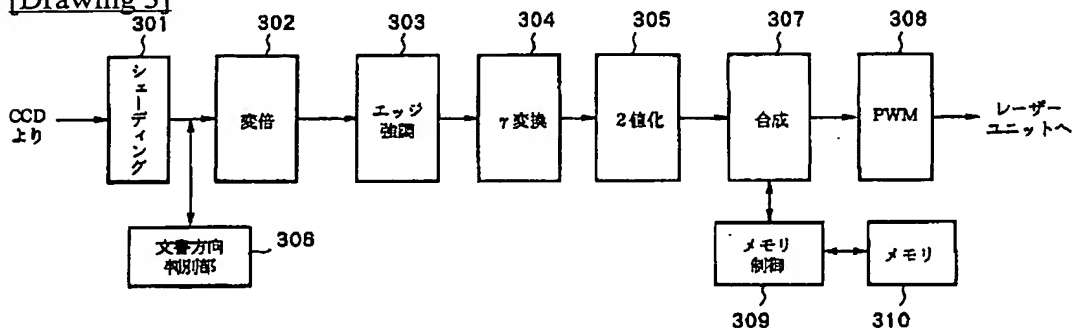
* NOTICES *

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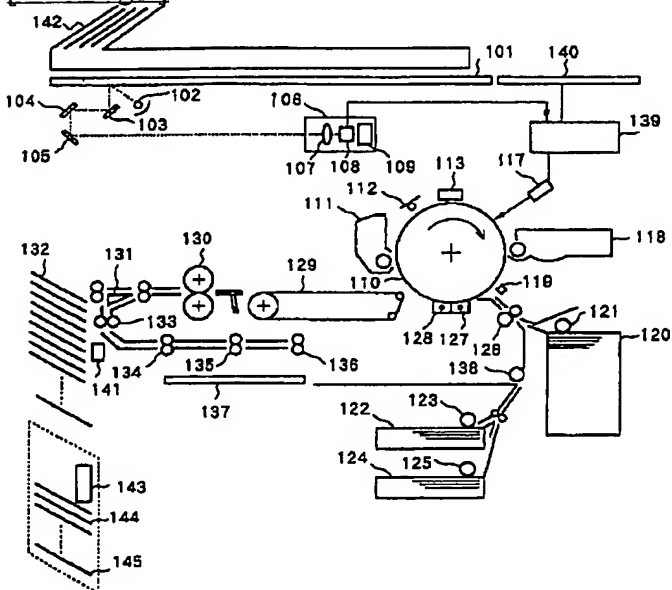
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

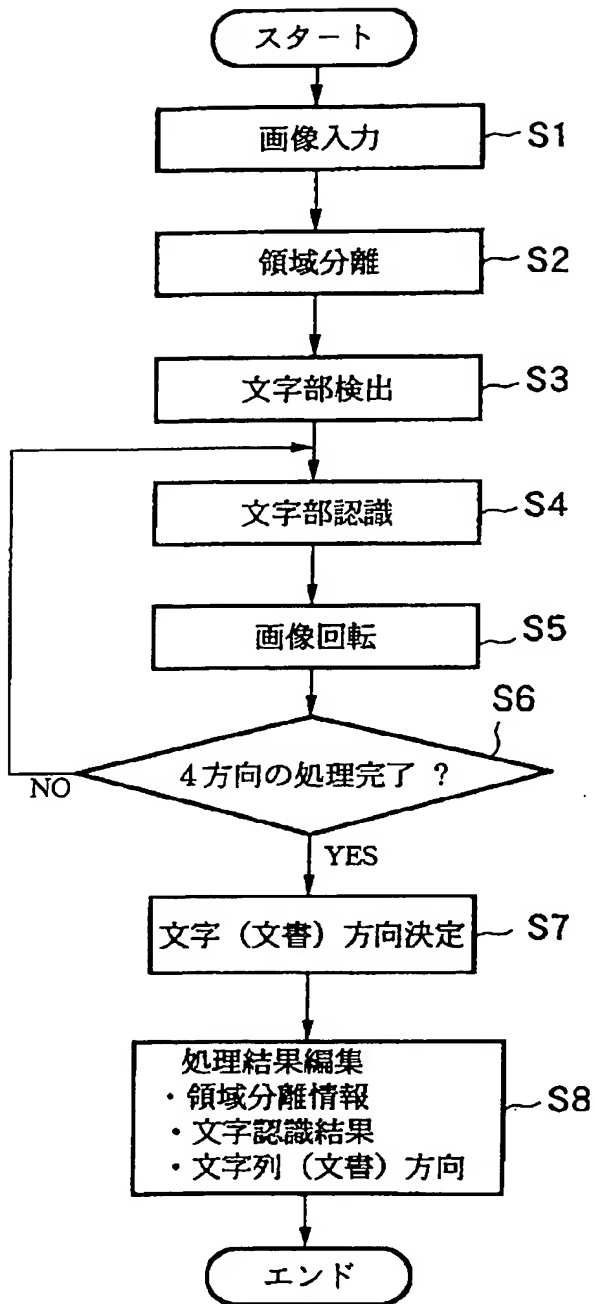
[Drawing 3]



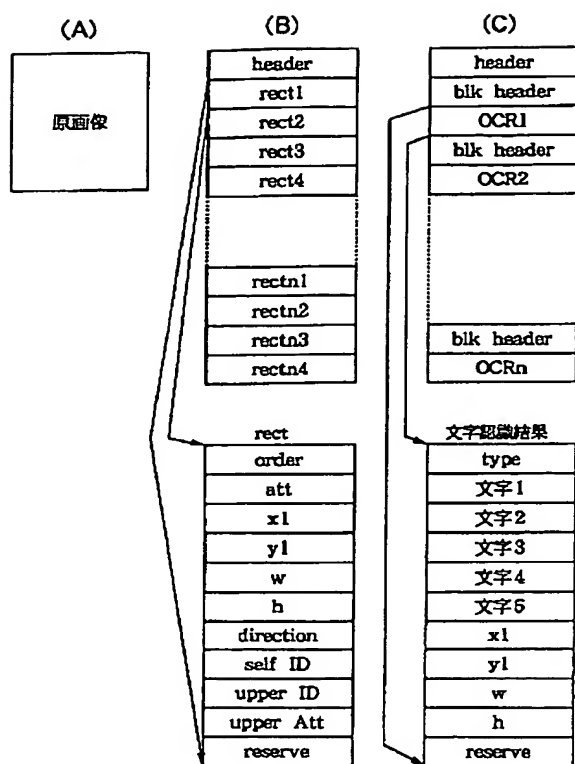
[Drawing 1]



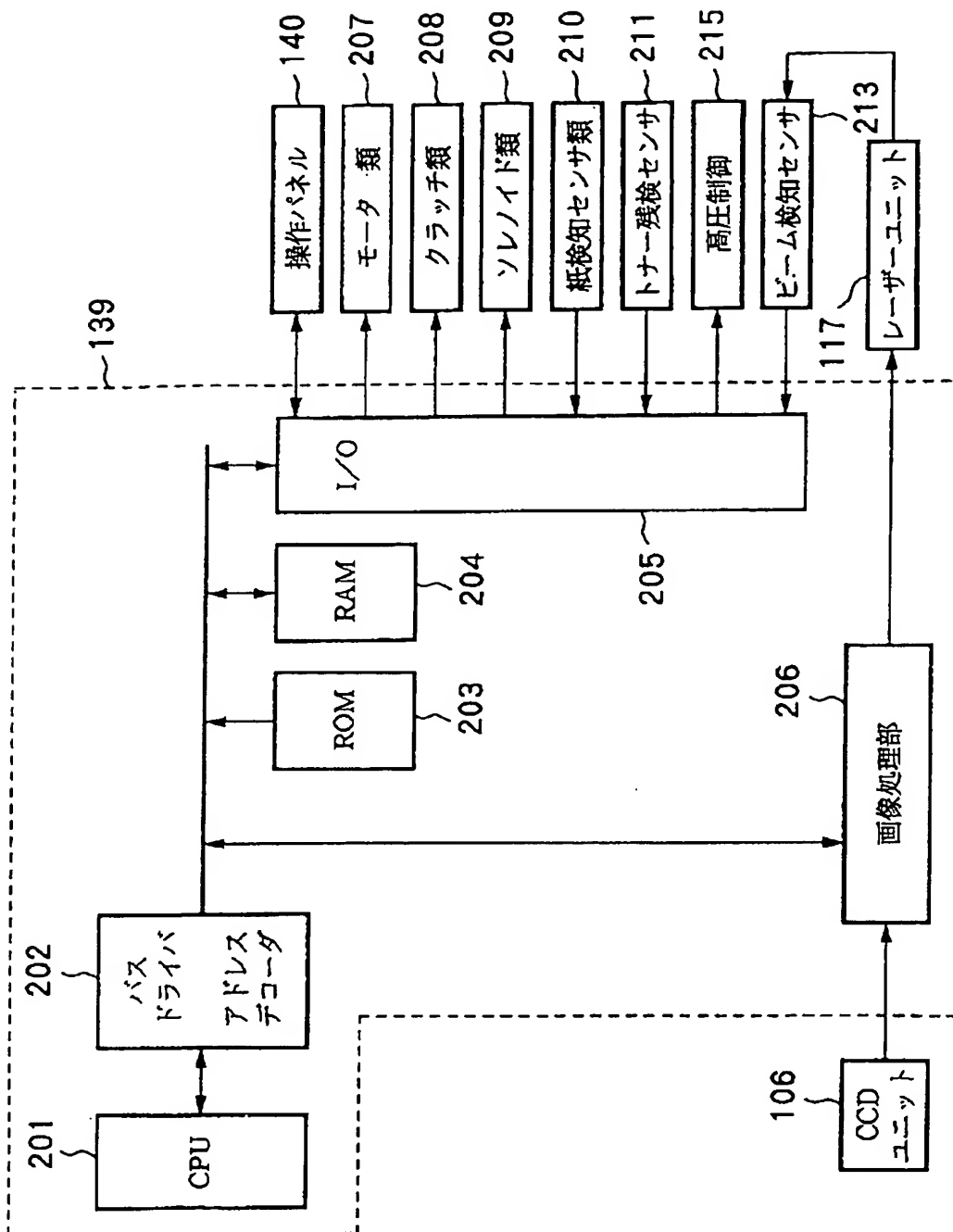
[Drawing 5]



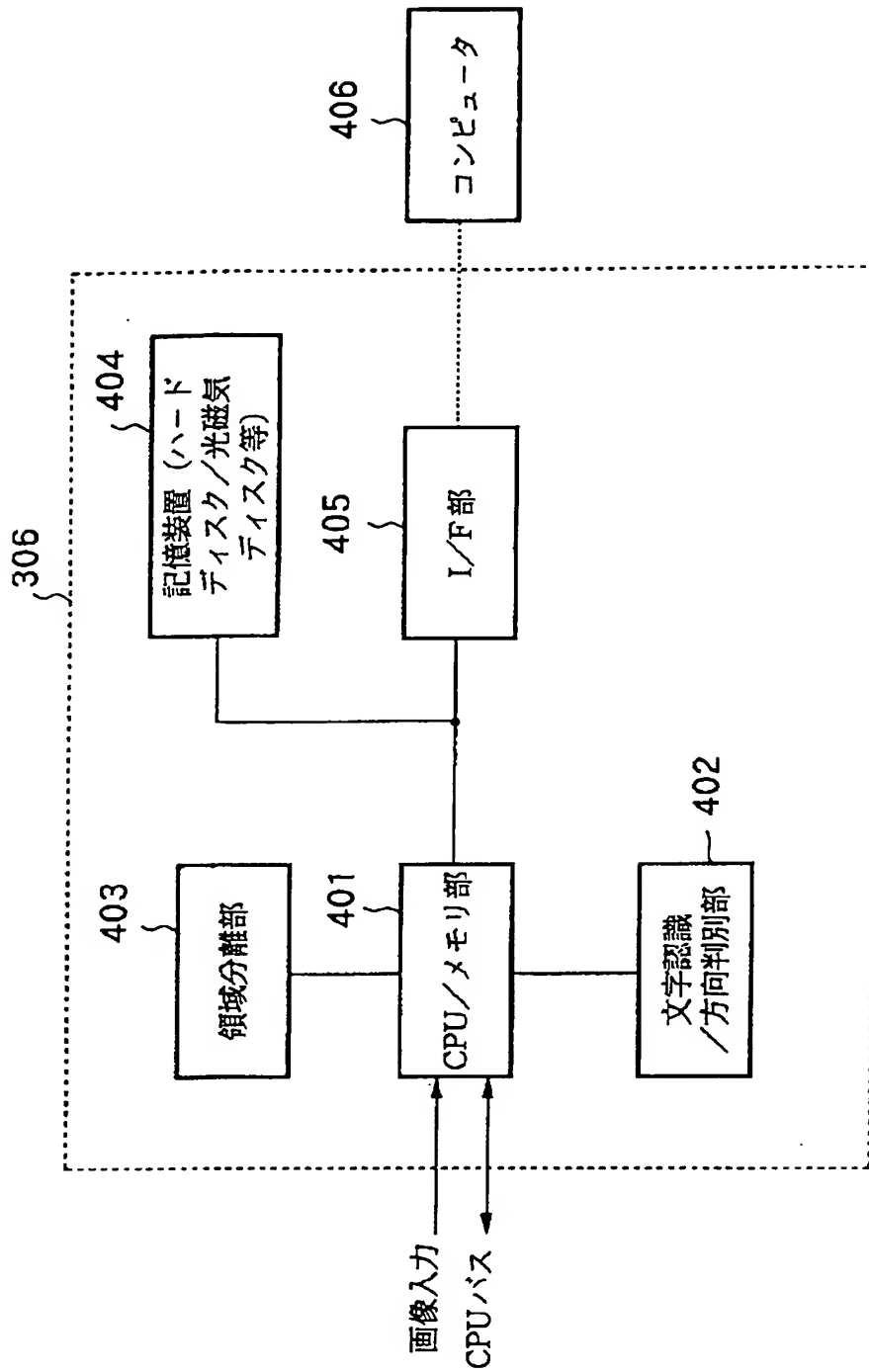
[Drawing 9]



[Drawing 2]



[Drawing 4]



[Drawing 6]

(d)

1.	本発明の名称
2.	文字認識装置
3.	A4Rの原稿の場合

(c)

1.	本発明の名称
2.	文字認識装置
3.	A4Rの原稿の場合

(b)

1.	本発明の名称
2.	文字認識装置
3.	A4Rの原稿の場合

(a)

1.	本発明の名称
2.	文字認識装置
3.	A4Rの原稿の場合

[Drawing 7]

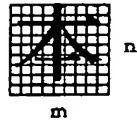
(a)

1. 本発明の名称
2. 文字認識装置
3. A4普通原稿の場合
.....
.....
.....
.....

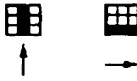
(b)

本発明の名称

(c)



(d)



[Drawing 8]

(a)

本発明の名称

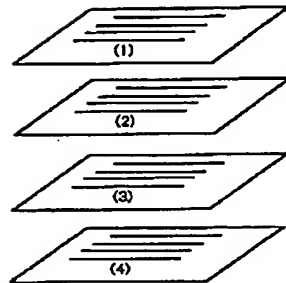
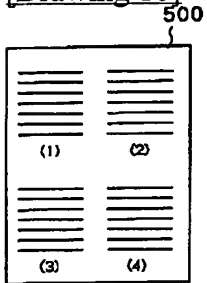
(b)

本発明の名称

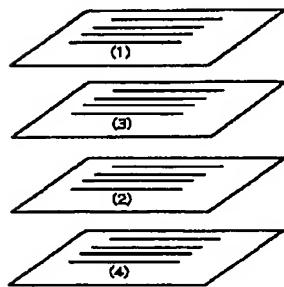
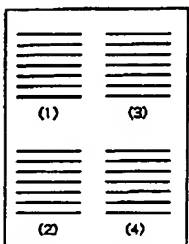
(c)

	0	90°	180°	270°
	本	✕	ㄥ	⦿
認識文字	本	町	克	式
自信度	0.90	0.40	0.30	0.50

[Drawing 10]

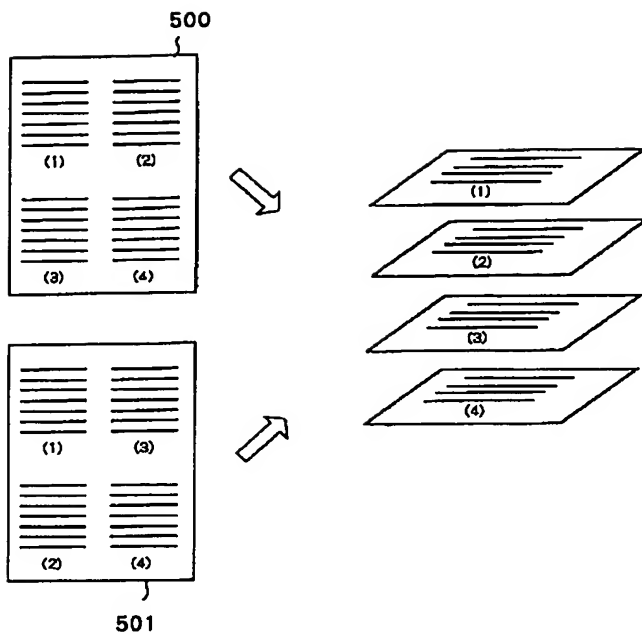


(A)

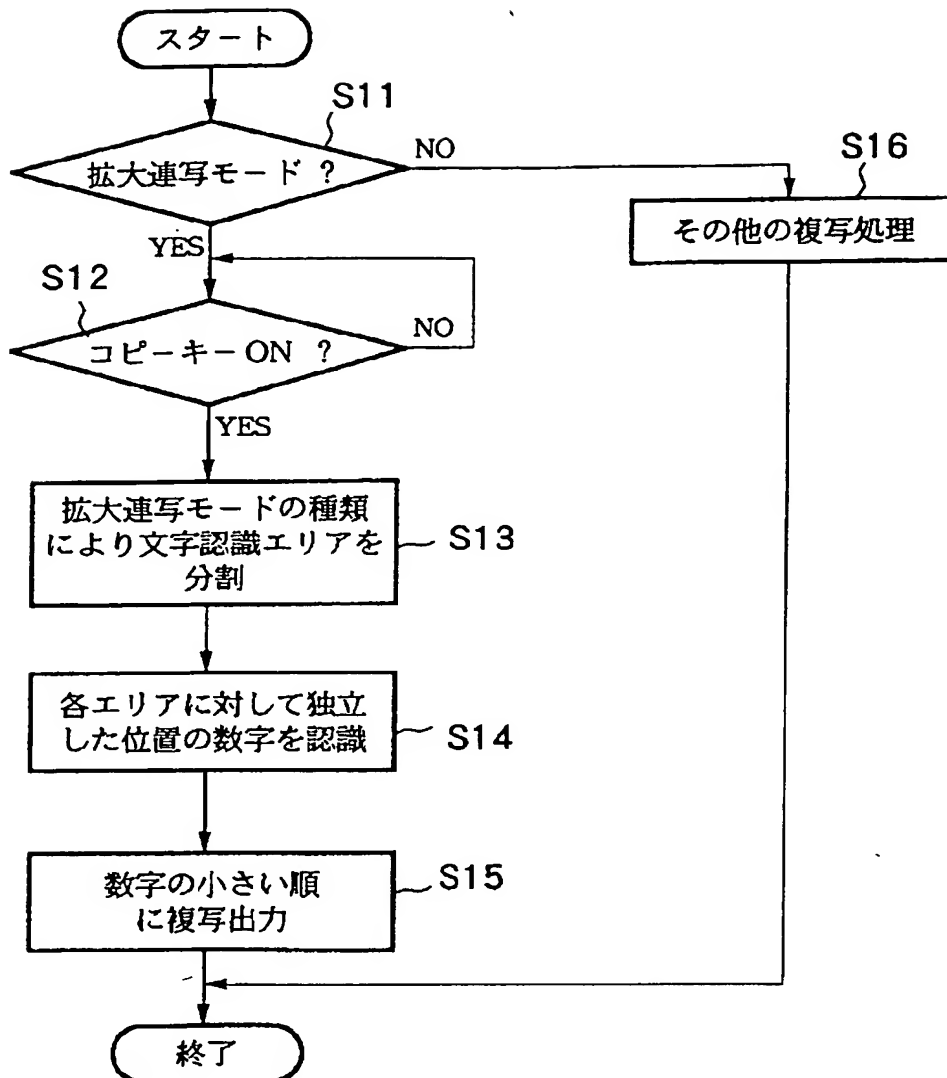


(B)

[Drawing 12]



[Drawing 11]



[Translation done.]

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G 0 6 F 15/62

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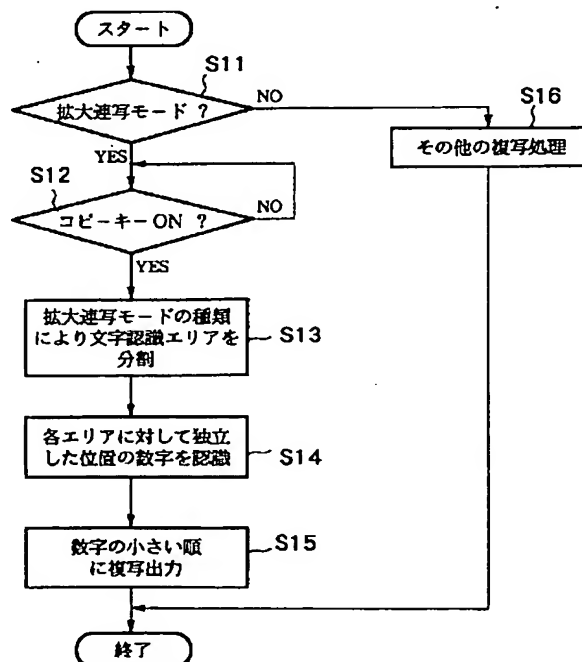
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(54) 【発明の名称】 画像形成方法及び装置

(57) 【要約】

【課題】 縮小レイアウト印刷された原稿から、その元の原稿画像のページ順に画像を取り出して拡大連写できる画像形成方法および装置を提供する。

【解決手段】 縮小レイアウト印刷された原稿に含まれる複数枚分の画像のそれぞれを拡大して1頁分の画像として形成して拡大連写コピーする際、入力した画像データに含まれる複数枚分の画像のそれぞれに含まれる文字を認識し (S 1 4)、その認識した文字の順にソートして出力する (S 1 5)。



【特許請求の範囲】

【請求項1】 画像データを入力して画像を形成する画像形成装置であって、
前記画像データに含まれる複数枚分の画像のそれぞれに含まれる文字を認識する文字認識手段と、
前記複数枚分の画像を1頁分の画像として形成する形成手段と、
前記形成手段により形成された画像を、前記文字認識手段により認識された、前記画像に対応する文字の順にソートして出力する出力手段と、を有することを特徴とする画像形成装置。

【請求項2】 請求項1に記載の画像形成装置であって、前記文字認識手段は前記画像に含まれるページ番号を認識することを特徴とする。

【請求項3】 請求項1に記載の画像形成装置であって、前記形成手段は前記複数枚分の画像のそれぞれを拡大して1頁分の画像として形成する事を特徴とする。

【請求項4】 請求項1乃至3のいずれか1項に記載の画像形成装置であって、複数枚分の画像を縮小して印刷した原稿画像を読み取って入力する画像入力手段を更に有することを特徴とする。

【請求項5】 請求項3に記載の画像形成装置であって、入力される画像データに含まれる画像の枚数を指示する指示手段を更に有し、
前記文字認識手段は、前記入力された画像を前記指示手段により指示された枚数に応じた数の領域に分割し、前記分割された領域のそれぞれに含まれる文字を認識することを特徴とする。

【請求項6】 請求項5に記載の画像形成装置であって、前記形成手段は更に、前記指示手段により指示された枚数に応じて画像データを拡大することを特徴とする。

【請求項7】 画像データを入力して画像を形成する画像形成方法であって、 前記画像データに含まれる複数枚分の画像のそれぞれに含まれる文字を認識する文字認識工程と、
前記複数枚分の画像を1頁分の画像として形成する形成工程と、
前記形成工程で形成された画像を、前記文字認識工程で認識された、前記画像に対応する文字の順にソートして出力する出力工程と、を有することを特徴とする画像形成方法。

【請求項8】 請求項7に記載の画像形成方法であって、前記文字認識工程では前記画像に含まれるページ番号を認識することを特徴とする。

【請求項9】 請求項7に記載の画像形成方法であって、前記形成工程では前記複数枚分の画像のそれぞれを拡大して1頁分の画像として形成する事を特徴とする。

【請求項10】 請求項7乃至9のいずれか1項に記載の画像形成方法であって、複数枚分の画像を縮小して印

刷した原稿画像を読み取って入力する画像入力工程を更に有することを特徴とする。

【請求項11】 請求項9に記載の画像形成方法であって、入力される画像に含まれる画像データの枚数を指示する指示工程を更に有し、
前記文字認識工程では、前記入力された画像を前記指示工程で指示された枚数に応じた数の領域に分割し、前記分割された領域のそれぞれに含まれる文字を認識することを特徴とする。

【請求項12】 請求項11に記載の画像形成方法であって、前記形成工程では更に、前記指示工程で指示された枚数に応じて前記画像データを拡大することを特徴とする。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、原稿画像データを入力して画像を形成する画像形成方法および装置に関するものである。

【0002】

【従来の技術】従来、複写機等において、複数の原稿画像を読み取り、それらを縮小して1枚の原稿上にレイアウトして印刷する縮小レイアウトが知られている。この場合、その縮小レイアウトされる画像の配置は、予め定められているレイアウトの中からオペレータが自由に設定できるようになっている。

【0003】

【発明が解決しようとする課題】このようにして縮小レイアウト印刷された原稿から、元の原稿画像に拡大して複数枚の原稿を印刷する拡大連写機能が知られている。

【0004】図10(A)(B)は、このような拡大連写動作を説明するための図である。図10(A)に示したように、例えば4枚の原稿が1枚の用紙に縮小して複写された原稿500において、原稿500の左上に1ページ目、右上に2ページ目、左下に3ページ目、右下に4ページ目の原稿がレイアウトされている。この原稿500を4枚に分割して複写する時は、図10(A)に示したように、1ページ目の画像から順に2, 3, 4ページと出力される。

【0005】これに対し図10(B)に示したように、原稿501の左上に1ページ目、右上に3ページ目、左下に2ページ目、右下に4ページ目がレイアウトされている原稿501を4枚に分割して複写する時は、図10(A)と同じ順序で出力すると、1ページの後に3ページ、その次に2ページ、4ページと出力され、ページの順に揃わなくなる。

【0006】更に後処理として、ステイプル処理や製本処理が選択されている場合、ページ順がそろっていないものが作成されてしまい、やり直す時はステイプルの針を外す、または製本時の糊を外して文書方向を整えて再度、後処理を行わなければならないなど手間がかかると

いう問題があった。。

【0007】本発明は上記従来例に鑑みてなされたもので、縮小レイアウト印刷された原稿から、その元の原稿画像のページ順に画像を取り出して拡大連写できる画像形成方法および装置を提供することを目的とする。

【0008】また本発明の目的は、種々のレイアウトで複数の原稿画像が縮小レイアウト印刷された原稿から、それら元の原稿画像の順序に従って拡大連写できる画像形成方法および装置を提供することにある。

【0009】

【課題を解決するための手段】上記目的を達成するために本発明の画像形成装置は以下のような構成を備える。即ち、画像データを入力して画像を形成する画像形成装置であって、前記画像データに含まれる複数枚分の画像のそれぞれに含まれる文字を認識する文字認識手段と、前記複数枚分の画像を1頁分の画像として形成する形成手段と、前記形成手段により形成された画像を、前記文字認識手段により認識された、前記画像に対応する文字の順にソートして出力する出力手段とを有することを特徴とする。

【0010】上記目的を達成するために本発明の画像形成方法は以下のような工程を備える。即ち、画像データを入力して画像を形成する画像形成方法であって、前記画像データに含まれる複数枚分の画像のそれぞれに含まれる文字を認識する文字認識工程と、前記複数枚分の画像を1頁分の画像として形成する形成工程と、前記形成工程で形成された画像を、前記文字認識工程で認識された、前記画像に対応する文字の順にソートして出力する出力工程とを有することを特徴とする。

【0011】

【発明の実施の形態】以下、添付図面を参照して本発明の好適な実施の形態を詳細に説明する。

【0012】図1は、本実施の形態の画像形成装置（デジタル複写機）の構成を説明する断面図である。

【0013】図において、101は原稿台ガラスであり、原稿自動送り装置（ADF）142から給送された原稿が順次、所定位置に載置される。102は、例えばハロゲンランプ等を有する原稿照明ランプで、原稿台ガラス101に載置された原稿を露光する。103、104、105は走査ミラーであり、図示しない光学走査ユニットに収容され、図1の左右方向に往復動しながら、原稿からの反射光をCCDユニット106に導いている。CCDユニット106は、CCD等の撮像素子108に原稿からの反射光を結像させる結像レンズ107、撮像素子108を駆動するCCDドライバ109等を備えている。撮像素子108からの画像信号出力は、例えば8ビットのデジタルデータに変換された後、コントローラ139に入力される。

【0014】110は感光ドラムであり、前露光ランプ112によって画像形成に備えて除電される。113は

1次帯電器であり、感光ドラム110の表面を一様に帯電させる。117は露光手段であり、例えば半導体レーザ等で構成され、画像処理や装置全体の制御を行うコントローラ139で処理された画像データに基づいて感光ドラム110を露光して、画像データに応じた静電潜像を形成する。118は現像器であり、黒色の現像剤（トナー）が収容されている。119は転写前帯電器であり、感光ドラム110上に現像されたトナー像を用紙に転写する前に高圧をかける。120、122、124は給紙ユニットであり、各給紙ローラ121、123、125の回転駆動により、転写用紙が装置内へ給送され、レジストローラ126の配設位置で一旦停止し、感光ドラム110に形成された画像との書き出しタイミングがとられて再給送される。127は転写帯電器であり、感光ドラム110に現像されたトナー像を、給送される転写用紙に転写する。128は分離帯電器であり、転写動作の終了した転写用紙を感光ドラム110より分離する。尚、転写されずに感光ドラム110に残ったトナーは、クリーナ111によって回収される。

【0015】129は搬送ベルトで、転写プロセスの終了した転写用紙を定着器130の位置に搬送し、例えば熱により画像の定着を行う。131はフラップであり、定着プロセスの終了した転写用紙の搬送パスを、ステイプルソータ132又は中間トレイ137の配置方向のいずれかに制御する。ステイプルソータ132に排紙された用紙は各ビンに仕分けされ、コントローラ139からの指示によりステイプル部141がステイプルを行う。133～136は給送ローラであり、一度定着プロセスが終了した転写用紙を中間トレイ137に反転（多重）または非反転（両面）して給送する。138は再給送ローラであり、中間トレイ137に載置された転写用紙を再度、レジストローラ126の位置まで搬送する。コントローラ139には、後述するマイクロコンピュータ、画像処理部等を備えており、操作パネル140からの指示に従って、前述の画像形成動作を行う。

【0016】図2は、本発明の実施の形態の画像形成装置におけるコントローラ139の構成を示すブロック図である。

【0017】図2において、201は本実施の形態の画像形成装置全体の制御を行うCPUであり、装置本体の制御手順（制御プログラム）を記憶した読み取り専用メモリ203（ROM）から制御プログラムを順次読み取って実行する。CPU201のアドレスバス及びデータバスは、バスドライバ、アドレスデコーダ回路202を経て各負荷に接続されている。また、204は入力データの記憶や作業用記憶領域等として用いる主記憶装置であるところのランダムアクセスメモリ（RAM）である。205はI/Oインターフェース・ポートであり、操作者がキー入力を行い、装置の状態等を液晶、LEDを用いて表示する操作パネル140や、給紙系、搬送

系、光学系の駆動を行うモータ類207、クラッチ類208、ソレノイド類209、また、搬送される用紙を検知するための紙検知センサ類210等の各負荷に接続される。

【0018】現像器118には、現像器内のトナー量を検知するためのトナー残量検知センサ211が配置されており、その出力信号がI/Oポート205に入力される。215は高圧制御ユニットであり、CPU201の指示に従って、前述の1次帯電器113、現像器118、転写前帯電器119、転写帯電器127、分離帯電器128への電圧値（高圧）を制御している。

【0019】206は画像処理部であり、CCDユニット106から出力された画像信号が入力され、後述する画像処理を行って、印刷用の画像データを生成する。こうして生成された画像データに従ってレーザユニット117を駆動する。こうしてレーザユニット117から出力されるレーザ光が感光ドラム110上を照射して露光するとともに、非画像領域において受光センサであるビーム検知センサ213によって、その発光状態が検知され、その出力信号がI/Oポート205に入力される。

【0020】図3は、本実施の形態の画像形成装置におけるコントローラ139内の画像処理部206の機能構成を示す機能ブロック図である。

【0021】CCD108により出力される電気信号に変換された画像信号は、まずシェーディング回路301によって画素間のばらつきが補正された後、変倍回路302において縮小コピー時はデータの間引き処理が行なわれ、拡大コピー時にはデータの補間が行われる。次に、エッジ強調回路303において、例えば5×5のウィンドウで2次微分を行って画像のエッジを強調する。この画像データは輝度データであるので、最終的に半導体レーザに出力するための濃度データに変換するため、変換回路304でテーブルサーチによりデータ変換を行う。こうしてガンマ変換回路304で濃度データに変換された画像データは、2値化処理回路305に入力される。ここで例えばED（誤差拡散）法により多値データを2値データに変換する。こうして2値データに変換された画像データは、合成回路307に入力され、その入力された画像データと、例えばDRAMにより構成される画像用メモリ310の画像データとを選択的、或は論理和をとって出力する。この画像用メモリ310に対するリードライト制御はメモリ制御部309で行われ、画像を回転させる場合は画像メモリ310の画像データの読み出しアドレスを制御することにより行われる。こうして合成回路307から出力された画像データは、半導体レーザの発光強度の信号に変換するためにPWM回路308に入力され、画像の濃度に従ったパルス幅の信号を露光手段117に出力する。また、変倍回路302から出力される画像データは文書方向判別部306に入力され、後述する文書方向の判別処理が実行される。

【0022】次に図4～図9を参照して、本実施の形態の文書方向判別部の動作について説明する。

【0023】図4は文書方向判別部306の構成を示すブロック図である。

【0024】図4において、シェーディング回路301から出力された画像データはCPU/メモリ部401に入力され、ここで画像データが一時的に保存されると共に各種制御が行われる。このCPU/メモリ部401は、コントローラ139のCPU201と、例えば図示しないデュアルポートRAM等を介してバス接続されており、これらの間でデータの送受信が行われる。尚、このデータ通信はもちろんシリアル通信でもよい。

【0025】文字認識/方向判別部402は、文書の方向を一番正確に表しているのは文字の方向であることに着目し、文書中の数種類の文字領域を0°、90°、180°、270°の各方向から文字認識を行い、それら各方向における文字認識の精度（文字認識の自信度：文字の特徴分布に対する距離）の中で一番精度の高い方向を求めて、それを文書方向とする。領域分離部403は、文字認識/方向判別部402による文字認識/方向判別処理を行うための前処理として、文書画像データより文字部、図形部、自然画部、表部などを、それぞれ矩形の領域に分離して、各領域の属性（文字部など）を付加する処理を行う。記憶部404は、例えば、ハードディスクや光磁気ディスクなどを有し、各種データの処理結果（画像データ、領域分離結果、文字認識結果など）を保存するために利用される。I/F部405は、例えばSCSIやRS232Cなどのインターフェース仕様により動作するインターフェース部で、コンピュータ406との間でのデータ伝送を制御している。コンピュータ406は、I/F部405を介して情報を得たり、記憶部404に記憶されたデータを獲得して利用する。

【0026】次に、本実施の形態における文書方向自動判別・補正、および文字認識処理の概要を図5のフローチャートに従って説明する。

【0027】ステップS1で入力された画像データ（多値画像）は、ステップS2で、領域分離部403により、文字部、図形部、自然画部、表部などの属性別に矩形の領域に分離される。ここで実際には、矩形で囲まれた領域情報を作成する。

【0028】次にステップS3に進み、各属性より文字領域の矩形情報を抽出する。ここで文字領域とは、文章部、タイトル部、表中の文字、図のキャプション部などである。

【0029】例えば、図6（a）（c）に示す文書の場合は、それぞれ図6（b）（d）に示したような文字領域の矩形情報が抽出される。そして、これらの中の数ブロックを用いて、そこに含まれる文字を回転角0°で認識する。次にステップS5に進み、その文字を90°回転させ、ステップS6で、0°、90°、180°およ

び 270° の4つの回転方向のそれぞれに対して文字認識を行ったかを調べ、これら4つの回転方向での文字認識が終了するまでステップS4～S6を繰返し実行する。

【0030】こうしてこれら4つの方向での文字認識結果が得られるとステップS7に進み、図8(c)に示すような各回転角における自信度に基づいて、その文字の方向を決定する。こうしてステップS8に進み、最終的に文字認識された回転角に従って文字列の方向が決定され、更に、これに対応する領域分離情報と文字認識情報が得られる。

【0031】ステップS5の画像回転処理における一つの方法としては、全回転画像データに対して再び領域分離処理を行う方法、もう一つは、アドレス変換を領域分離結果にかける方法がある。この領域分離処理は、一般に画像が正方向を想定しているため、初期の段階で行った領域分離処理と回転画像データに対して行った領域分離処理との結果が異なる場合が多い。それゆえ、前者の方法を取るのが望ましい。

【0032】この処理結果は、I/F部405を介してコンピュータ406に伝送され、コンピュータ406のファイリングのアプリケーション・プログラム等で利用される。また、コントローラ139のCPU201へ各画像毎に送信される。

【0033】次に、文字認識処理を用いた文書方向判別の手法について説明する。

【0034】〔領域分離処理〕文書画像データにおける黒画素を検出してゆき、輪郭追跡、またはラベリング方式により、黒画素ブロックの矩形枠を作成する。次に、その矩形の中の黒画素密度、隣接矩形ブロックの有無、矩形の縦横比率などを判断基準にして、文字領域（タイトル、本文、キャプションなど）、図形領域、自然画領域、表領域などを判別する。この判別結果により文字領域の矩形領域が判別される。

【0035】〔文字認識処理〕文字認識処理の一つの方法として、特徴ベクトル抽出、比較方式がある。例えば図7(a)に示したように、「本」という文字を含む文字領域が判別されたとする。第一段階として、この文字領域について文字切り出し処理を行う（図7(b)参照）。これは、一つの文字の矩形を切り出す処理で、黒画素連続性の状態を検出していけば求められる。

【0036】第二段階として、一文字を $m \times n$ （例えば 64×64 ）の画素ブロックに切り出す（図7(c)参照）。そして、その中から 3×3 画素のウィンドウを用いて、黒画素の分布方向を抽出する（方向ベクトル情報：図7(d)参照）。

【0037】なお、図7(d)は、方向ベクトル情報の一部を例示したものであり、上記 3×3 画素のウィンドウをずらしてゆき、方向ベクトル情報を数十個得る。このベクトル情報が文字の特徴となる。このベクトル情報

（特徴ベクトル）と予め記憶されている文字認識辞書の内容とを比較して、特徴ベクトルに特徴が一番近い文字から順番に文字を抽出する。この場合、特徴ベクトルに特徴が近い順番に第1候補、第2候補、…となる。この特徴ベクトルに対する特徴の近さが、その文字に対する距離の近さ、即ち、文字認識の自信度（精度、尤度）を示す数値になる。

【0038】〔文字方向判別処理〕このようにして文字認識の自信度が求められるが、その自信度に基づいた文字方向判別処理を、図8に示した「本発明の名称」という文字列の場合を用いて説明する。

【0039】図8(a)は正方向の文字列を示し、図8(b)は、その文字列を 270° 回転した文字列である。ここで文字「本」に注目すると、文字方向を判別する場合は、図8(c)に示したように、1つの文字「本」について 0° 、 90° 、 180° 、 270° の4方向から文字認識を行ってみる。これら回転角度のそれぞれは、文字矩形の領域の読み出し方を変更すればよく、特に原稿を回転する必要はない。

【0040】各回転角度における文字認識結果は、図8(c)に示したように、互いに異なっている。なお、図8(c)には説明用の仮の文字認識結果および自信度が示されており、現実はこの通りになるとは限らない。

【0041】図8(c)において、正方向(0°)から文字認識を行った場合は、「本」と正しく認識され、自信度も“0.90”と高い値となる。 90° 回転した方向から文字認識を行った場合は、「町」と誤認識され、自信度も“0.40”と低下する。このように誤認識が発生し、自信度も低下するのは、回転した方向から見た場合の特徴ベクトルに基づいて文字認識を行ったからである。同様に 180° 、 270° 回転した方向から文字認識を行った場合も誤認識が発生し、自信度も低下する。尚、文字認識の方向別の自信度は、複雑な文字であればあるほど、その差が顕著に現れてくる。

【0042】図8(c)の結果は、正方向の場合に自信度が1番高いため、文書は正方向に向いている可能性が高いと判断される。このような文字方向の判別精度を向上させるため、同一ブロック内の複数の文字について、同様に4方向から文字認識を行ってみる。更に、1つのブロックだけで文字方向を判別した場合、特殊な文字列について文字方向を誤って判別するおそれがあるので、複数のブロックについて同様の文字認識を行ってみる。そして、各ブロックについて、当該ブロック内の各認識対象文字の4方向別の自信度の平均値を求め、さらに、各ブロックでの4方向別の自信度の平均値に対する平均値を求め、この平均値が最も高い方向を文字方向（文書方向）として認定する。

【0043】このように、1文字だけの自信度で文字方向を認定することなく、同一ブロック内の複数文字、更には同一ブロック内の複数文字の自信度で文字方向を認

定することにより、文字（文書）方向を高精度に判別することが可能となる。ただし、1文字だけの自信度で文字方向を判別したり、あるいは同一ブロック内の複数文字の自信度で文字方向を判別しても、従来よりも高精度に文字方向を判別できる。

【0044】次に、文字方向（文書方向）の判別結果が正方向以外の方向であるときは、文字方向が正方向になるように原画像を回転する。この回転は、図4のCPU／メモリ401を用いて公知の技術により簡単に行うことが可能であり、その説明は省略する。

【0045】以上のような処理により、図9（A）に示した原画像データ、図9（B）に示した領域分離データ、図9（C）に示した文字認識情報を得ることができる。これらの情報は前述のようにコントローラ139のCPU201に送られ、各種画像処理、各種制御に使用する。

【0046】ここで領域分離データのデータ形式は図9（B）に示したように、領域分離データである旨を示す「header」と、分離した領域の識別子「rect1」～「rect4」により構成され、これら識別子で区別された各領域（ブロック）の情報は、ブロックの番号「order」、ブロックの属性（文字部、図形部など）「att」、ブロックの左上の座標値「x1」および「y1」、ブロックの幅「w」、ブロックの高さ「h」、縦書き又は横書きを示す「direction」、当該ブロックのIDである「selfID」、当該ブロックを包含する親ブロックのIDである「upperID」、親ブロックの属性「upperAtt」、予備領域「reserve」により構成されている。

【0047】また、文字認識情報は、図9（C）に示したように、文字認識情報である旨を示す「header」を有し、例えば「本」等の単一の文字に関する文字認識情報「OCR1」等と、当該文字が含まれているブロックを示す上記「rect1」等に相当する「blkheader」との組み合わせ情報により構成されている。

【0048】そして、「OCR1」等の各文字認識情報は、文字であるか或いは空白であるかを示す「type」、前述の文字認識の自信度に従った第1～第5候補文字「文字1」～「文字5」、当該文字の切り出し位置「x1」および「y1」、当該文字の幅「w」、当該文字の高さ「h」、予備領域「reserve」により構成されている。

【0049】次に、図11のフローチャートと図12を参照して、本実施の形態の画像形成装置における拡大連写コピー動作の詳細を説明する。

【0050】まずステップS11で拡大連写コピーモードが選択されたかどうかを判断する。拡大連写コピーモードではない場合はステップS16に進み、指示された複写処理動作を行って終了する。

【0051】ステップS11で拡大連写コピーモードが選択されるとステップS12に進み操作パネル140のコピースタート・キーの入力待ちとなる。操作パネル140のコピースタート・キーが押下されるとステップS13に進み、原稿ガラス台101上に載置された原稿をCCDユニット106の走査により読取り、設定された拡大連写コピーモードにより、そのCCDユニット106で読み取った原稿画像1枚分の画像データの文字認識エリアを分割する。この処理は画像処理部206で実行される。ここでは例えば1to4モード（縮小レイアウトで印刷された1枚の原稿から元の4枚の原稿を印刷）であれば4つのエリアに、1to6モードであれば6つのエリアに分割する。次にステップS14に進み、それら分割された各エリアに対して、所定の位置に存在する数字（例えばページ番号）を前述した文字認識処理により認識する。そしてステップS15に進み、その認識した数字の小さい順に、ステップS13で分割された各エリアの画像データをそれぞれ原稿1枚のサイズに拡大して複写出力する。この場合、例えば図10の如く、1to4であれば、その拡大率は2×2となる。なお、拡大連写コピーについては既に周知であるため、詳しい説明は省略する。

【0052】以上の動作により図12に示したように、図10で説明したような、左上に1ページ目、右上に2ページ目、左下に3ページ目、右下に4ページ目がレイアウトされている原稿500の場合も、また左上に1ページ目、その下側に2ページ目、右下に3ページ目、右下に4ページ目がレイアウトされている原稿501の場合でも、1ページから順番に拡大連写コピー出力することができる。

【0053】尚、本実施の形態では、原稿の順番は、元の各原稿画像の中央下部に記載されたページ番号に基づいて決定しているが本発明はこれに限定されるものでなく、例えば右或は左上端、又は下端等に附されたページ番号、或は各原稿の所定位置に記された、それら原稿を並べたい順を示す数字（ページ番号とは限らない）等の基づいて、拡大連写したコピーの出力順を決定しても良い。

【0054】なお、本発明は、複数の機器（例えばホストコンピュータ、インタフェイス機器、リーダ、プリンタなど）から構成されるシステムに適用しても、一つの機器からなる装置（例えば、複写機、ファクシミリ装置など）に適用してもよい。

【0055】また、本発明の目的は、前述した実施形態の機能を実現するソフトウェアのプログラムコードを記録した記憶媒体を、システムあるいは装置に供給し、そのシステムあるいは装置のコンピュータ（またはCPUやMPU）が記憶媒体に格納されたプログラムコードを読み出し実行することによっても達成される。

【0056】この場合、記憶媒体から読出されたプログ

ラムコード自体が前述した実施形態の機能を実現することになり、そのプログラムコードを記憶した記憶媒体は本発明を構成することになる。

【0057】プログラムコードを供給するための記憶媒体としては、例えば、フロッピディスク、ハードディスク、光ディスク、光磁気ディスク、CD-ROM、CD-R、磁気テープ、不揮発性のメモ리카ード、ROMなどを用いることができる。

【0058】また、コンピュータが読出したプログラムコードを実行することにより、前述した実施形態の機能が実現されるだけでなく、そのプログラムコードの指示に基づき、コンピュータ上で稼働しているOS（オペレーティングシステム）などが実際の処理の一部または全部を行い、その処理によって前述した実施形態の機能が実現される場合も含まれる。

【0059】さらに、記憶媒体から読出されたプログラムコードが、コンピュータに挿入された機能拡張ボードやコンピュータに接続された機能拡張ユニットに備わるメモリに書込まれた後、そのプログラムコードの指示に基づき、その機能拡張ボードや機能拡張ユニットに備わるCPUなどが実際の処理の一部または全部を行い、その処理によって前述した実施形態の機能が実現される場合も含まれる。

【0060】以上説明したように本実施の形態によれば、拡大連写コピーの際に、縮小レイアウト印刷された複数の原稿画像を含む原稿における、各原稿画像のページ番号等の文字情報を認識することにより、それら元の原稿画像を所望のページ順で出力できる。

【0061】

【発明の効果】以上説明したように本発明によれば、縮小レイアウト印刷された原稿から、その元の原稿画像の

ページ順に画像を取り出して拡大連写できるという効果がある。

【0062】また本発明によれば、種々のレイアウトで複数の原稿画像が縮小レイアウト印刷された原稿から、それら元の原稿画像の順序に従って拡大連写できるという効果がある。

【図面の簡単な説明】

【図1】本発明の実施の形態の画像形成装置の構成を説明する断面図である。

【図2】本実施の形態の画像形成装置のコントローラの構成を示すブロック図である。

【図3】本実施の形態のコントローラの画像処理部の機能構成を示す機能ブロック図である。

【図4】本実施の形態の文書方向判別部の構成を示すブロック図である。

【図5】本実施の形態における文書方向自動判別と文字認識処理を示すフローチャートである。

【図6】本実施の形態における文書方向の判別処理での領域分離を説明する図である。

【図7】本実施の形態における文字認識処理の処理過程を説明するための図である。

【図8】本実施の形態の文書（文字）方向の自動判別処理を説明するための図である。

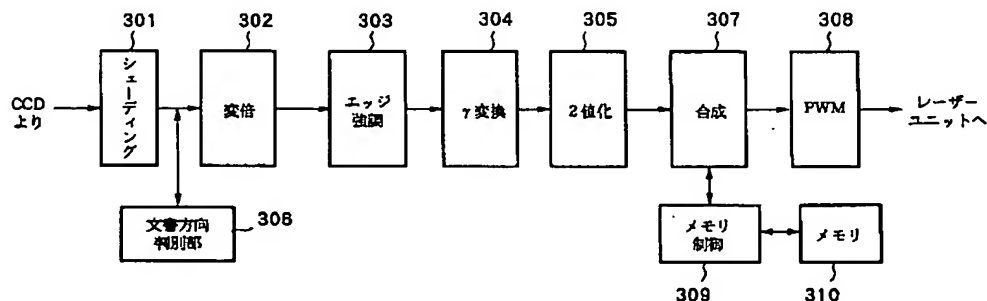
【図9】本実施の形態における領域分離および文字認識情報のデータ形式を示した図である。

【図10】従来例を説明するための図である。

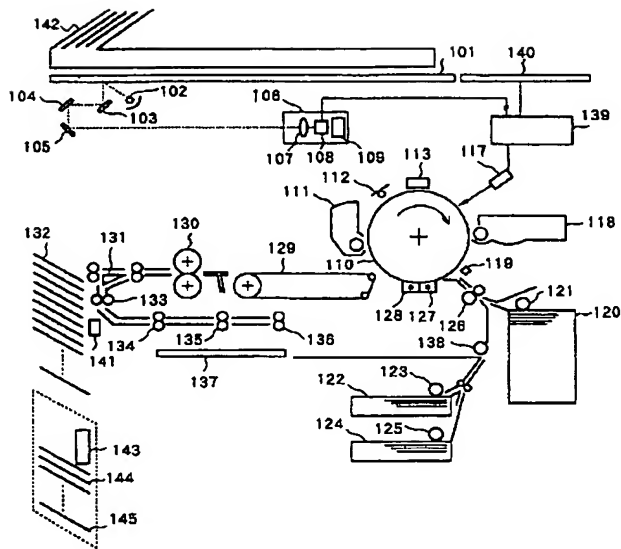
【図11】本発明の実施の形態の画像形成装置における拡大連写モードでの処理を示したフローチャートである。

【図12】本発明の実施の形態における拡大連写コピーを説明する図である。

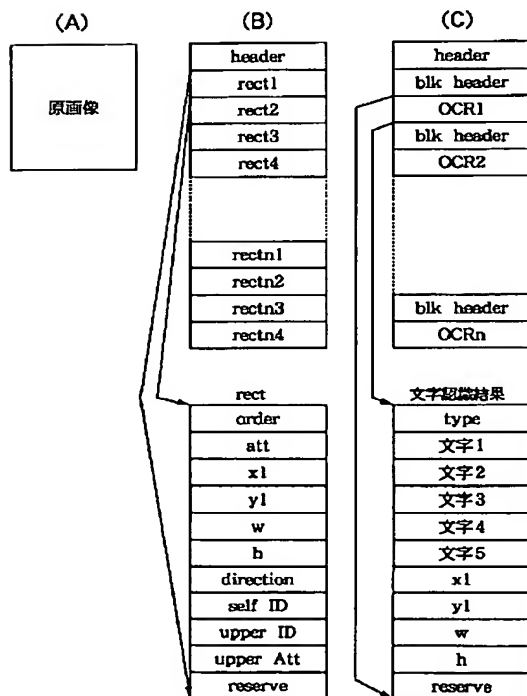
【図3】



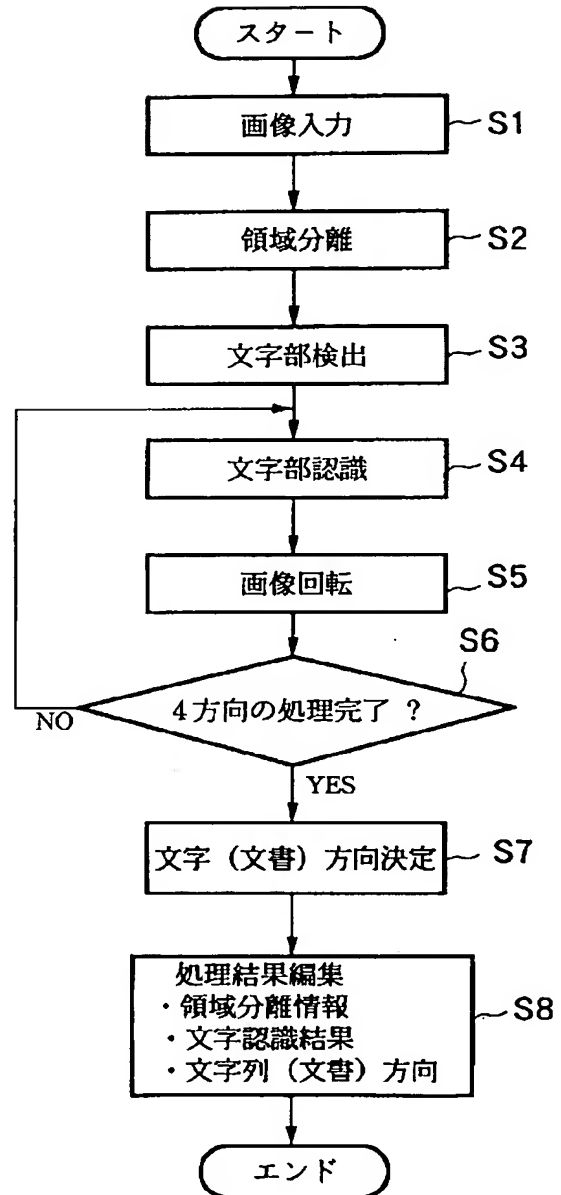
【図1】



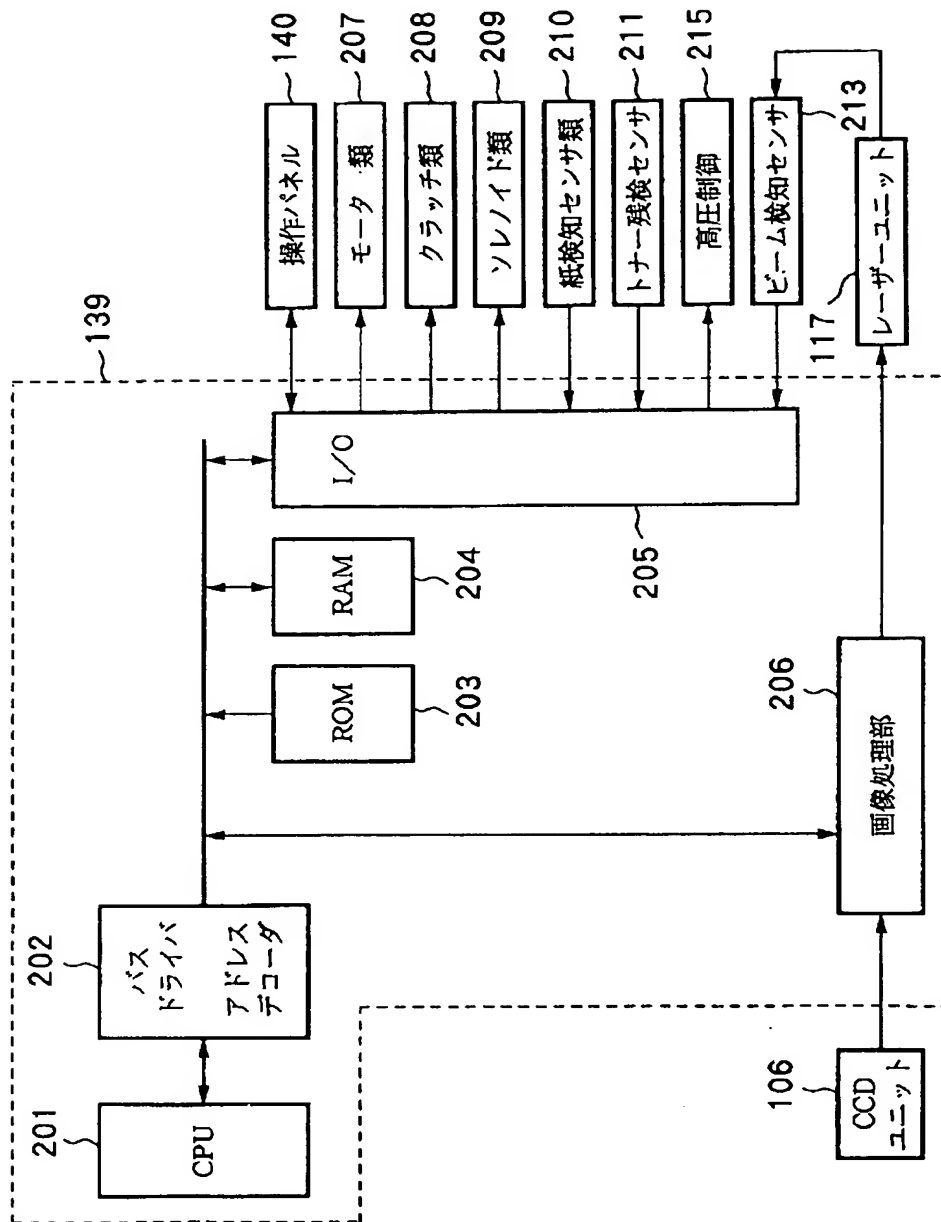
【図9】



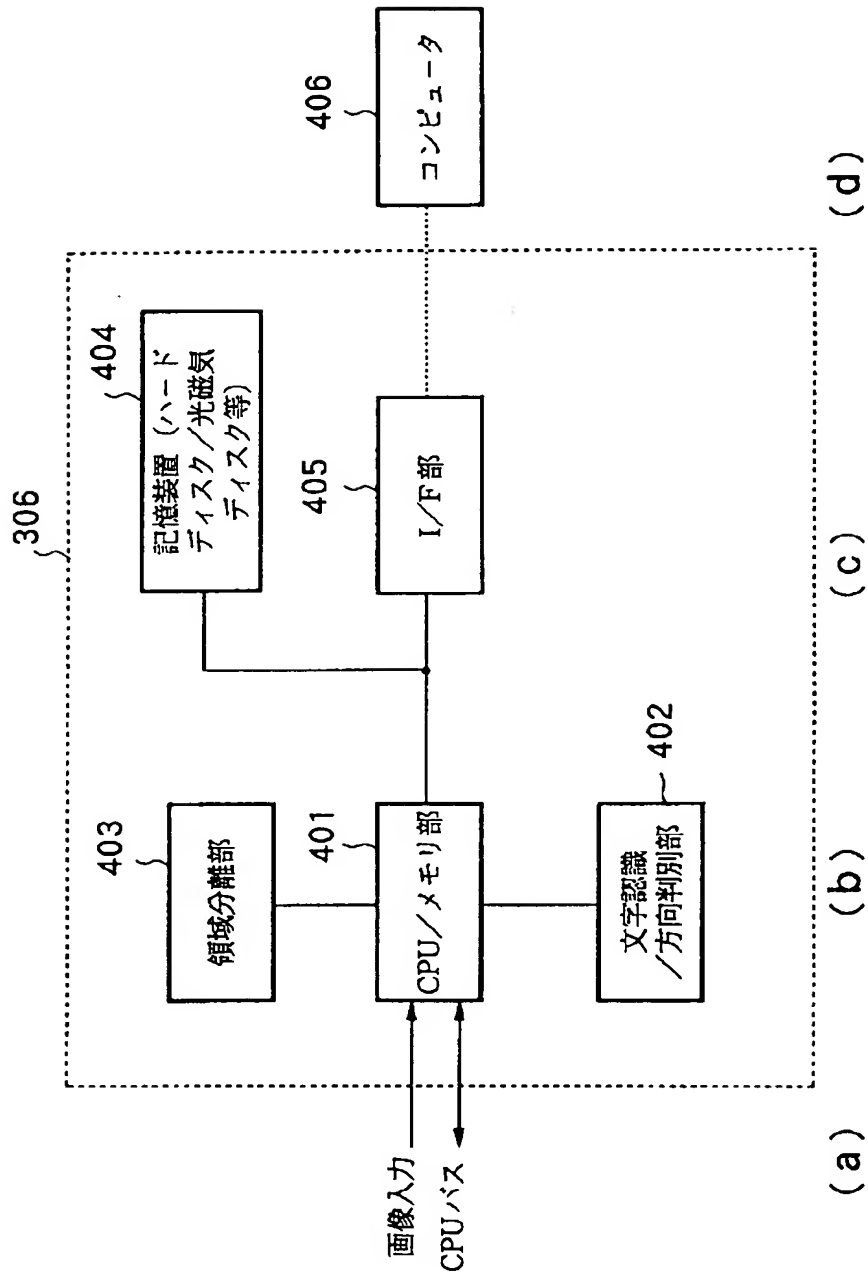
【図5】



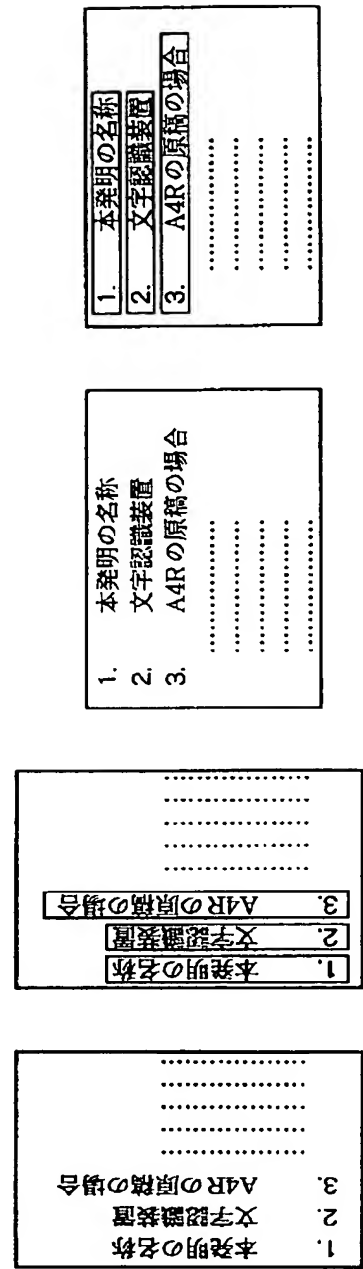
【図2】



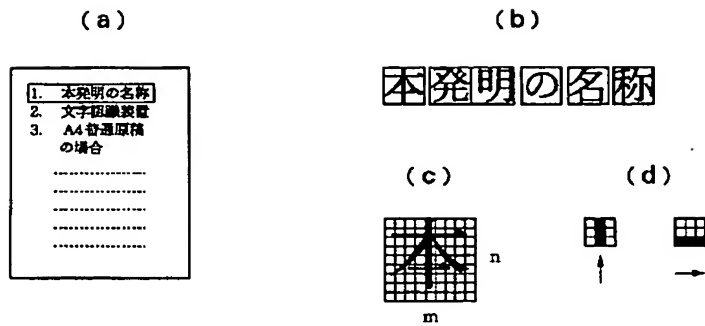
【図4】



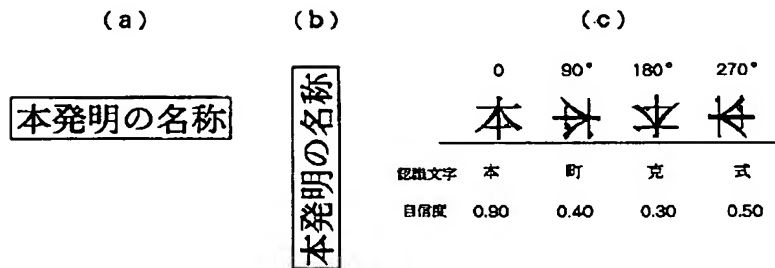
【図6】



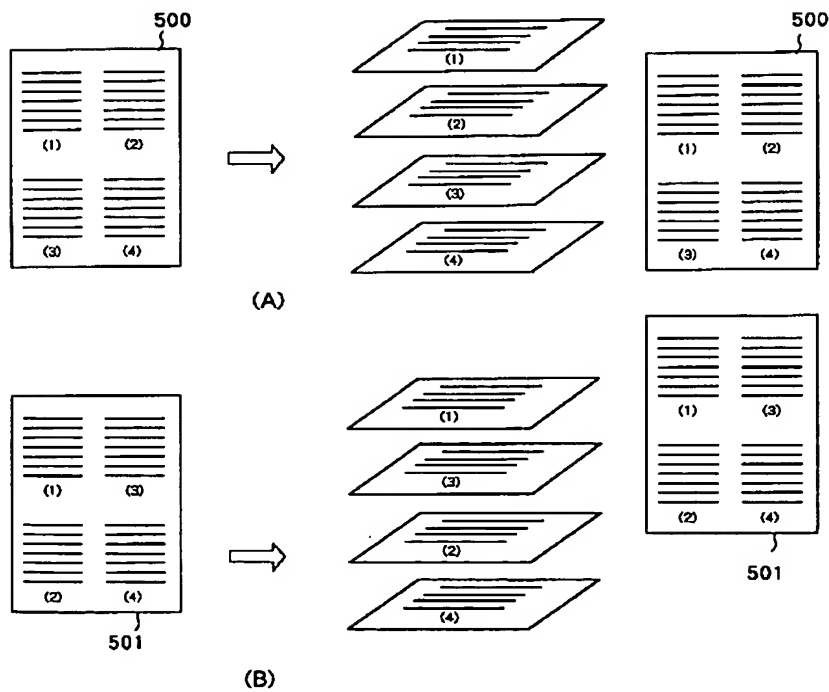
【図7】



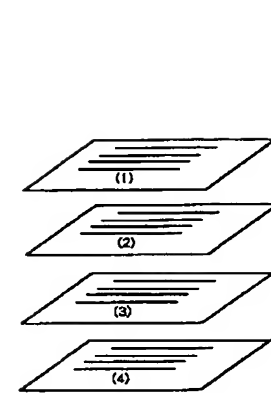
【図8】



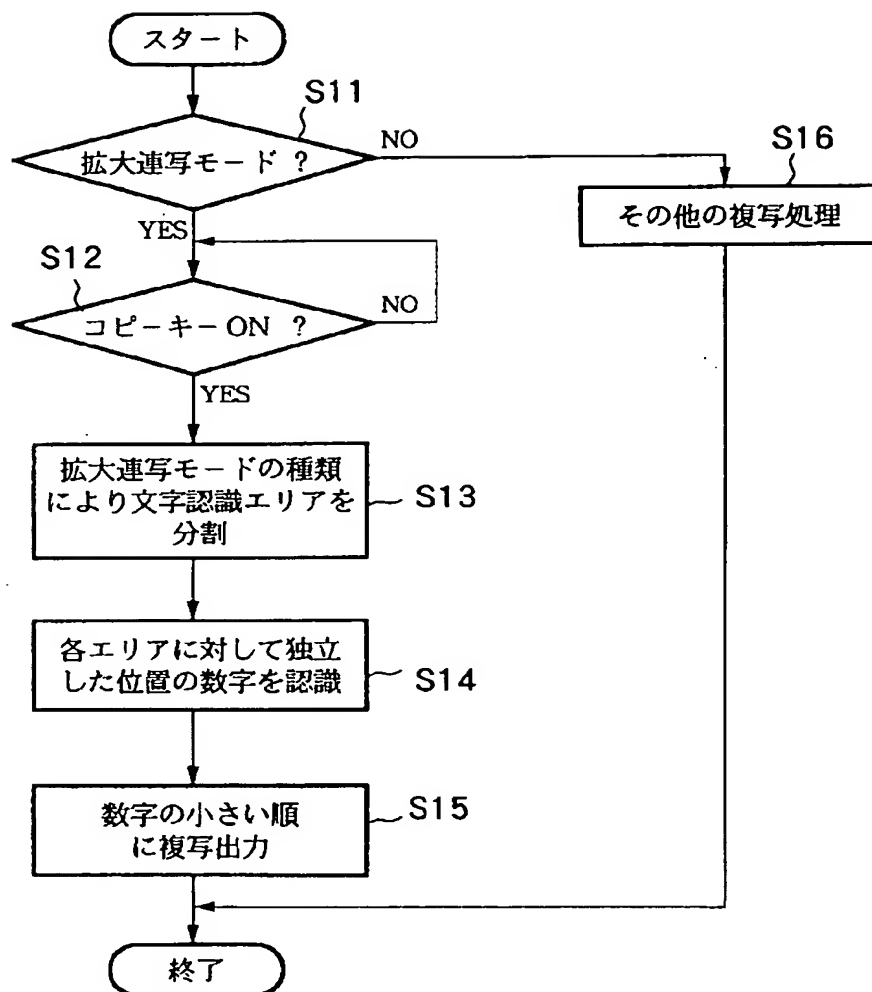
【図10】



【図12】



【図11】



フロントページの続き

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